SCIENTIFIC AMERICAN

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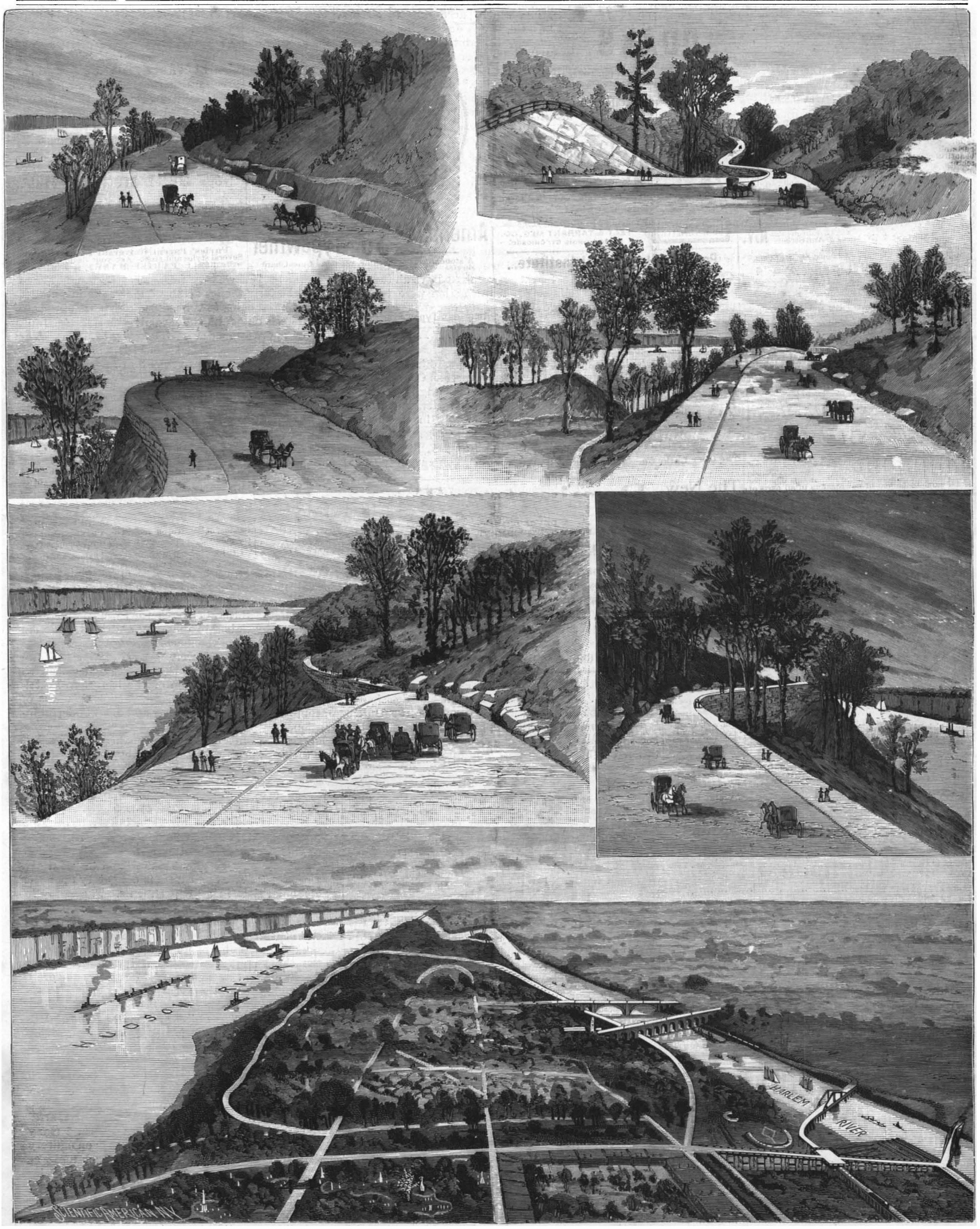
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXII.—No. 4. ESTABLISHED 1845. NEW YORK, JANUARY 26, 1895 [$3.00 A YEAR. WEEKLY.



THE BOULEVARD LAFAYETTE NEW YORK CITY—VIEWS FROM DIFFERENT POINTS ON THE BOULEVARD—BIRD'S EYE VIEW OF THE BOULEVARD AND CONNECTIONS.—[See page 58.]

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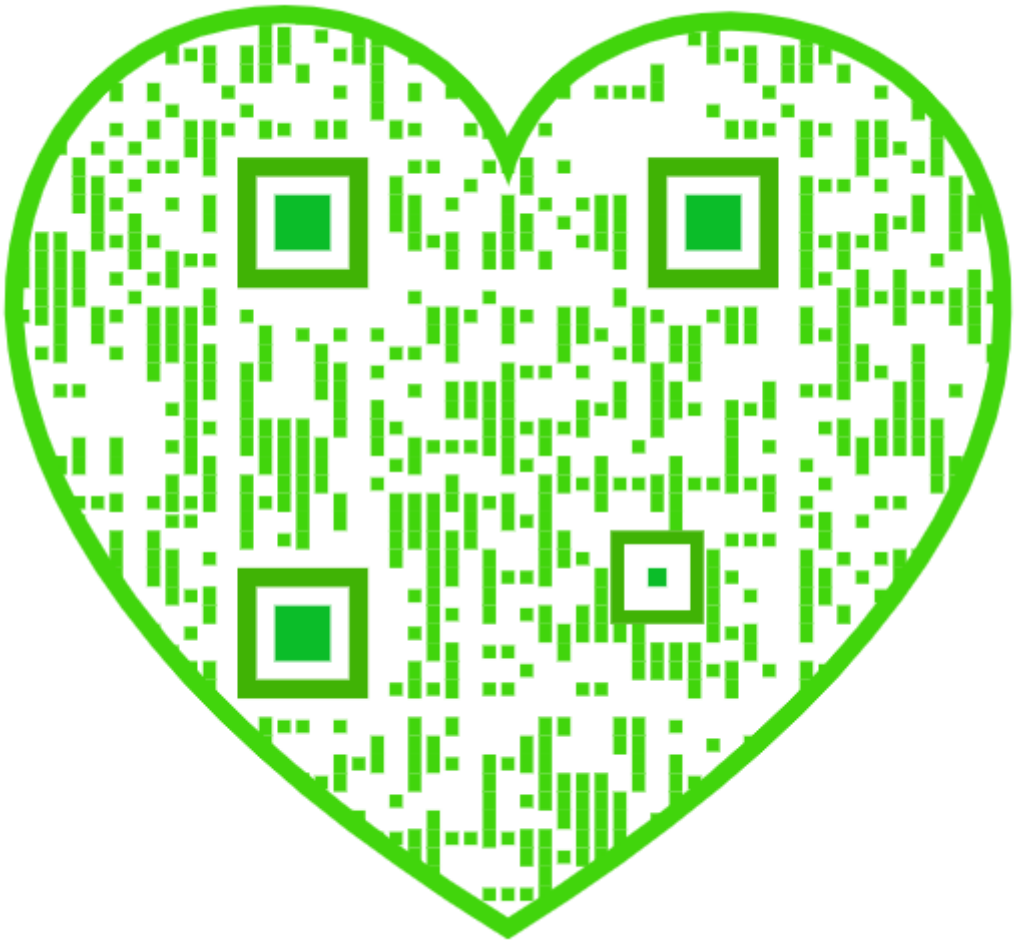

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
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MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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NEW YORK, SATURDAY, JANUARY 26, 1895.

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AMERICAN FIREARMS IN GERMANY.

The German government is celebrated for its care of its people. Its laws are enacted and applied to the conservation of the health and lives of the populace, whether threatened by impure foods or other causes. Sometimes the German laws affect the importation of American goods. The German inspection of the smaller class of firearms has operated to completely prevent the sale of American guns.

The German laws provide for the proving by actual firing test of all firearms exposed for sale in that country. The law passed in 1891 states that the barrels and locks must be tested in official testing establishments, and if approved must be stamped. The law describes the testing, which, according to circumstances, consists in a single or a double shooting trial. Any parts of the piece which fail to stand the trial are destroyed by being sawed into or by being broken up.

The law admits as valid the proof marks of the Belgian government "proof house," and also the proof marks of the Gun Makers' Company, of London, and of the Birmingham "proof house." The effect is that American guns are practically excluded from the German market. To secure admission the trade should arrange for the establishment of a proof house whose mark or stamp should be acceptable to the German government. As it now stands, all American guns have to be subjected to trial in Germany, and the expense has proved to be prohibitive. Since the acceptance of the English and Belgian proof marks, the business in American guns has come to a standstill. There is an excellent opportunity for the gun trade of this country to take some action which will open for us the German market. It might have an excellent effect upon the home product if action were taken in the direction of proving arms for our domestic trade.

THE STATUTES OF LIMITATIONS IN PATENT SUITS.

To the doctrine of diligence in prosecuting cases within the Patent Office is now superadded by a recent decision of the United States Supreme Court an affirmation of the need of diligence in suing for damages for infringement. It is held that the statutes of limitation of the different States apply in the defense of actions at law for damages for infringement of patents. The decision, dated January 7, 1895, was delivered by Mr. Justice Brown. The case is entitled Campbell v. City of Haverhill.

The action was brought to recover damages for infringement of the claims of a patent, which infringements were committed between October 10, 1877, and December 20, 1880, and was begun more than six years after the last date of infringement. It was an action at law, brought in the United States Circuit Court in the district of Massachussets. The Massachusetts laws declare that a limitation of six years applies to all actions of tort—that such actions must be begun within six years of the time when the acts were committed. The Circuit Court decided that the statute of limitations applied to this case. The Supreme Court upholds the Circuit Court.

The United States Revised Statutes, section 721, declare that "the laws of the several States, except, etc., . . . shall be regarded as rules of decision in trials at common law, in the courts of the United States, in cases where they apply." This section has been repeatedly held to apply to the statutes of limitation of different States. The question then came up as to whether this section would apply in cases purely within the jurisdiction of the Federal courts, such as a patent case, based entirely on the United States statutes. In the words of the decision it is expressed thus: "It may be well questioned whether there is any sound distinction in principle between cases where the jurisdiction is concurrent and those where it is exclusive in the Federal courts. The section itself neither contains nor suggests such a distinction."

The court holds that an action for infringement of a patent should involve no privileges denied to the plaintiff side in other actions. It holds that it would be an anomaly to establish a class of actions subject to no statute of limitations. If this were the law, users of patented inventions, perhaps innocent of any wrong intention, might be "fretted" by actions brought against them after all their witnesses are dead.

The court, therefore, finds that practical considerations are favored by their decision that the statute of limitations does apply, and a quantity of decisions are quoted to illustrate the subjection of rights created by Congress to various laws of individual States.

It may very pertinently be asked why this point was not settled long ago, for it has never been presented directly to the Supreme Court until now. There were two cases found bearing directly on it, but they were Circuit Court cases and were decided in exactly opposite ways. The reason why the Supreme Court has never decided the question until now lies in the fact that the majority of patent cases are brought for present infringement of a live patent and ask for an injunction and an accounting. Proverbially, there is little money in an accounting—the injunction is the object principally sought. But in the case just spoken of, the patent had expired and damages were sought for infringements committed during its life. Such actions are generally regarded as of little value to any one except the lawyers and masters or referees, and hence are seldom brought.

The Telautograph in Europe.

From private advices received in Chicago, the Western Electrician learns that the long-expected test of Gray's telautograph over the long-distance telephone line between Paris and London came off on the night of December 15, and resulted in a great success. The line is under the control of the French and English governments, and as no newspaper men were present, no publicity has heretofore been given to this interesting and important event.

Some delay at the outset was caused by a broken wire at the Paris end, but after this was remedied the telautograph representatives wrote back and forth for an hour and a half without any trouble. The French government was represented by three engineers, who were delighted with the result. The distance over which the writing was electrically reproduced was 312½ miles, and all agreed that it was a wonderful spectacle to watch in Paris the instantaneous reproduction of the movements of a pen in the hands of a man writing in London.

Of the 312½ miles of line, 23 miles is submarine cable and 5½ miles consists of buried conductors at Paris. All of the English land line is overhead. Current was supplied, at the London end, by a battery of bichromate cells, two rows in parallel, the voltage being 57, while at Paris there were storage batteries and Callaud cells, the latter being arranged four rows in parallel, the potential being 63 volts. The resistance of the circuit was 716 ohms and the capacity was 11 microfarads. The platen resistance at each end was 550 ohms. The difference in voltage at the ends of the line was merely an incident due to convenient arrangement of the batteries. No change from ordinary conditions was made in the machines or adjustments, except in the Morse relays.

The actual counted speed of transmission was 18 words in 36 seconds at one time and 22 words in 40 seconds at another, the average number of letters in each word being five. The writing was perfectly legible, but somewhat ragged at very high speed.

The French minister of posts and telegraphs, with the officers of his staff, visited the laboratory at Paris and inspected the machines, appearing to be much interested. One of the department engineers will make an official report of the test to the government of France.

The telautograph was exhibited and explained at a special meeting of the Societe Internationale des Electriciens in Paris on December 18. M. J. Voisenat, a telegraph engineer, delivered the lecture, which was illustrated by elaborate diagrams and by the actual operation of a set of the machines. About 300 persons were present and all were greatly interested and eager to obtain samples of the electrically transmitted writing. At the conclusion of the lecture A. Postel-Vinay, the president of the society, spoke in terms of warm praise of Dr. Elisha Gray and his wonderful invention.

Mr. Cushing, in a recent letter, makes amusing allusion to the difficulties experienced by the Frenchmen in pronouncing American names. Dr. Gray is known as Eleezi-g-r-r-r-ay and Mr. Cushing has become Monsieur Coosteen.

Military Science at Yale University.

The Sheffield Scientific School of Yale University offers this year two interesting courses of instruction in "Military Science and Tactics" and in "Military Engineering." The first course is obligatory upon the whole senior class in all departments. The study in both courses will be carried on for the most part by lectures, though practical instruction in drill will be given in the School of the Soldier and School of the Company, if a number of students desire it. The names of the three most distinguished students in this department are sent to the adjutant-general of the army and are published in the Army Register, and also are sent to the adjutant-general of the State to which the student belongs. The object of the instruction of both these courses of study, it is stated, is to disseminate military information and to awaken interest in the application of arts of peace to those of possible war.

The courses propose to take up and discuss such topics as military economy, the American military problem, modern war on field and map, statistics and logistics, strategy and campaigning, the use of artillery and infantry, the minor tactics of war and many other similar problems. And in the course on military engineering lectures will be delivered on such topics as systems of fortifications, sea coast defenses, hasty intrenchment, military bridges, ballasting machines, modern ordnance, military electric installation, etc. These courses will terminate with examinations, and a special military certificate will be awarded by the regular army officer in charge of the department.

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An Attack on the Diphtheria Antitoxin.

A paper of the greatest interest and importance was read at a recent meeting of the Berlin Medical Society, by Dr. Hansemann. The paper carries especial weight because the author is announced as an assistant of Professor Virchow, and his work and conclusions are presumably indorsed by the dean of modern pathology.

Dr. Hansemann comes out in flat contradiction of the alleged properties and powers of the Behring immunizing serum. He asserts that in Bretonneau's diphtheria the Loeffler bacillus is not always present, and is not its sole cause. This view will appeal to some clinicians and bacteriologists at least, for it is admitted that the Loeffler bacillus is present in some very mild cases of diphtheria as well as in apparently healthy throats, while, on the other hand, it is also known that a streptococcus diphtheria (or sore throat) is sometimes extremely severe and dangerous.

Dr. Hansemann asserts that Loeffler's bacillus is found constantly in rhinitis fibrosa, without producing dipththeria, and that these alleged pathogenic microbes may multiply in the throat without modifying the course of the diphtheria. All this, we believe, will have to be admitted by pathologists who have without bias studied the disease. Dr. Hansemann asserted further that in the case of animals an injection of a Loeffler bacillus culture caused, not diphtheria, but a disease sui generis, the Loeffler bacillus disease; that epidemic diphtheria had never been observed in animals; that guinea pigs, in contact with diphtheria patients, had never taken diphtheria; but that a case is known where a cat, with which a child suffering from diphtheria had played, had developed all diphtheria symptoms without, however, any Loeffler bacilli being discoverable.

He then proceeded to describe the three qualities claimed for the antitoxin—namely, its therapeutic action, its harmlessness and its immunizing power. He said that the present statistics give an erroneous impression (as already shown by Gottstein in his recently published pamphlet), as many children suffering from lighter forms of throat complaints are now sent to the hospitals to be treated with serum, thus swelling the proportion of cured cases, which would, he said, otherwise not be higher than the usual average. He said that the serum injections could by no means be considered harmless, as affections of the kidneys had frequently followed, in one case more severe in type than had ever yet been observed after diphtheria. He said that it was clear, from Behring's new directions to increase the immunizing dose from sixty to one hundred and fifty unities, that no results have yet been achieved as far as immunizing goes.

The final criterium of the efficacy of the antitoxin treatment is clinical experience. Even if Hansemann's pathology is correct, therefore, it will make no difference, provided the diphtheria patients get well.

The difficulties in estimating exactly the value of a new therapeutic procedure, which comes loudly heralded and solidly indorsed, are very great. Unusual attention is paid to every patient, greater watchfulness, more thorough supervision and earlier diagnosis and treatment are always found. These factors must all be considered in estimating the results of the serum treatment.

It would be not only a disappointment to all well-wishers of humanity, but would be a serious blow to the rising prestige of medical science, if, after all, the serum treatment should fall short of its high expectations.—Medical Record.

The Late A. L. Dennison.

Mr. Aaron L. Dennison, who was known as the father of American watch making, died in Birmingham, England, Jan. 11, 1895, at the age of 82. While still a youth he was apprenticed to a watchmaker, and soon became acquainted with the many different Swiss and English watch mechanisms. He was struck, during a visit to the Springfield Armory, with the idea of applying the interchangeable plan to the manufacture of watches, muskets at that time being made on that system. It was a long time before he found capitalists to enter into watch making. At last in 1850 he formed with Messrs Howard, Davis and Curtis the American Horologue Co. Mr. Dennison made a trip to England and found that American watches could be made which would successfully compete with the English ones, where from fifteen to twenty people in different places were employed on each watch. A factory was built in 1851 at Roxbury, Mass., and a model watch was made by Mr. Dennison. It was designed to run eight days with one winding; this plan was, however, abandoned in subsequent watches. The first hundred American watches were put on the market in 1853. It soon became necessary to enlarge the factory, and the whole plant was moved to Waltham, Mass. The company was not prosperous, and in 1857 it was forced to make an assignment. The firm then became Appleton, Tracy & Co., and Mr. Dennison was continued as superintendent until 1861. In 1859 the firm name was changed to the American Watch Co. After leaving the American Watch Co., Mr. Dennison formed with A. O. Bigelow the Trement Watch Co. In 1866 Mr. Dennison retired and went to Zurich, Switzerland, where he made an unsuccessful attempt to introduce American methods into Swiss watch making. He then went to England and assisted in organizing the English Watch Co. In 1875 he began the manufacture of watch cases in Birmingham, the firm being known as Dennison, Wigley & Co.

A few years ago Mr. Dennison made a trip to America and received an ovation at every watch factory he visited. Mr. Dennison had many reverses in business, so that his wealth at his death was not great. Mr. Dennison remained a true American to the day of his death, and the world is greatly indebted to him as the pioneer of a great American industry.

Progress of the Bicycle.

The recent Bicycle Exhibition, Chicago, was a great success. The attendance was very large and the exhibits very interesting. The same may be said of the exhibition at Madison Square Garden, New York, January 19 to 26. The Wheel has the following:

In cycle construction the one fact which stands out above all others is that the metal rim is well nigh a thing of the past. Wood rims are almost universally used. Nearly every maker present will use them almost exclusively hereafter. The Eagle people will use their aluminum rim, and Gormully & Jeffery a steel rim, but both are prepared to furnish wood rims when desired, the latter even estimating that nine-tenths of their output will be fitted with the wooden felly. This universal use of wood rims will undoubtedly amaze and possibly flabbergast John Bull and his followers.

The reduction in weight has also reached a startling point. Twenty-pound road wheels are plentiful, and the manufacturer who is carrying anything over 28 pounds is the exception and not the rule. This information is also calculated to cause the English gentleman to wrinkle his brow and scratch his head. This marvelous reduction in weight would have been considered nothing short of phenomenal two years ago. Even some of the most intelligent and best posted of the mechanical minds present confess that the light weight bicycle of to-day has no parallel as a sustainer of weight. They are even at a loss to explain how and why they can hold up. The simple fact remains that they do. Simply to show what can be done, the Black Manufacturing Company and Munger Cycle Company are exhibiting wheels weighing less than nine pounds. They have been and can be ridden, but are not offered as practical mounts.

A general narrowing of tread, and general use of detachable sprockets, both front and rear, is another marked feature of this year's wheels, 5½ inches appears to be the average tread, although many that are narrower are very much in evidence.

With the feather-weight wheels has come a great increase in the new gears. A rough average would make 66 inches the standard gear for 1895. Seventy inches and over will be in quite general use next year. Two changeable speed gears are in evidence, and attract considerable attention, but none of the larger makers have yet seen fit to make them a feature of even their special wheels.

Large tubing is used in very many instances, but is not employed so generally as advance reports had led one to expect. In the Lozier wheels ¼ inch tubing is used. This is the largest in evidence. It gives the wheel a substantial but heavy appearance.

Adjustable handle bars have also made progress. The Pope Co., Lozier & Co., Peerless Manufacturing Co., Waltham Cycle Co., and Syracuse Cycle Co. being among the manufacturers who adopted the adjustable bar. The Warwick Cycle Manufacturing Co., Yost Manufacturing Co. and Stearns & Co. used it last year and still retain it. The Pope Co., however, is the only concern which is fitting the adjustable bar to their entire output. The Wheel can hardly believe that the demand and necessities will call for its general use, and scarcely expects that it will become a permanent feature, not even of the Columbias. Of the new adjustable bars shown at this place for the first time, that used by the Peerless Co. on their Triangle wheel appears to be about the simplest and most practical and ingenious.

A deal of attention has, as usual, been lavished on the crank bracket groups. The general desire to obtain a narrow tread in many instances has led to some ingenious but complicated creations. There also seems a tendency toward the use of a crank and crank axle in one piece. The object being apparently to lessen the number of nuts, washers and keys usually employed as a fastener.

A very general change in the construction of pedals is also observable. A projection on the outside is now rarely to be seen. Nearly all are either rounded or made flush or very nearly flush with the outer pedal plate.

No little attention has been given to the method of reinforcing the joints. On many wheels the reinforcing tube is on the outside. Something distinctly novel in this line is a triangular reinforcement employed in the Hoffman bicycle. This reinforcement is not confined entirely to the joints, but runs the entire length of certain tubes. The Union Cycle Co. and Hay & Willetts are using an X-shaped reinforcement at all joints.

Of course nearly all makers are now offering several heights of frames. In this respect it is worthy of note that all heights are built with the top bar of the frame perfectly horizontal, except in the Rambler, Columbia, and Victor wheels. These firms build their highest frame with a perfectly horizontal bar, but in the wheels of shorter reach it is placed at an angle.

A distinct advance in the construction of ladies' wheels is a noteworthy feature of the 1895 outputs. In previous years, wheelmen had but little more than a Hobson's choice, and a very weighty one at that. Now, however, the ladies' wheels have been reduced to the same weights, proportions and equipments as those built for men's use. Not only this, but very many of the firms are carrying three and four patterns of ladies' wheels—a straight frame, a loop frame, a demi-loop frame and a diamond frame safety, with 26 inch wheels, built specially for ladies' use.

The Chicago show has also developed what the Wheel stated some months since—that there was an unmistakable demand in the air for tandems.

At least half a dozen firms are this year manufacturing bicycles "built for two." All, or very nearly all, are built on most attractive lines, and are of the double steering type and marvelously light; few of them approach 40 pounds.

The "Missing Link" Found at Last.

No publication of late date is likely to excite more interest than a quarto of forty pages which has just been issued from the local press of Batavia, with the title, "Pithecanthropus Erectus. Eine Menschenanliche Uebergangsform aus Java. Von Eug. Dubois, Militararzt der Niederland. Armee."

This noteworthy essay contains the detailed description of three fragments of three skeletons which have been found in the early Pleistocene strata of Java, and which introduce to us a new species, which is also a new genus and a new family, of the order of primates, placed between the Simiidæ and Hominidæ—in other words, apparently supplying the "missing link" between man and the higher apes which has so long and so anxiously been awaited.

The material is sufficient for a close osteological comparison. The cubical capacity of the skull is about two-thirds that of the human average. It is distinctly dolichocephalic, about 70°, and its norma verticalis astonishingly like that of the famous Neanderthal skull. The dental apparatus is still of the simian type, but less markedly so than in other apes. The femora are singularly human. They prove beyond doubt that this creature walked constantly on two legs, and when erect was quite equal in height to the average human male. Of the various differences which separate it from the highest apes and the lowest men, it may be said that they bring it closer to the latter than to the former.

One of the bearings of this discovery is upon the original birthplace of the human race. The author believes that the steps in the immediate genealogy of our species were these: Prothylobates: Anthropopithecus Sivalensis: Pithecanthropus erectus: and Homo sapiens. This series takes us to the Indian faunal province and to the southern aspects of the great Himalayan chain, as the region somewhere in which our specific division of the great organic chain first came into being.—Science.

Treatment for Cleft Palate.

An interesting article, by Eugene F. Hoyt, M.D., on the successful treatment of cleft palate appears in the current number of the Brooklyn Medical Journal. Cleft palate is a malady, it may be seen, which not only causes great physical suffering, but acute mental distress. There are two methods of treatment generally employed, namely, surgery, which causes great pain and suffering, and secondly, by means of mechanical devices.

After an intelligent review of the subject, the article calls especial attention to the invention of a flexible palate, made some thirty years ago by Dr. Norman W. Kingsley, whose office is now at 115 Madison Avenue, New York City. It appears that in cleft palate there is an absence of tissue, and however closely the sides of the cleft may be brought together and united, perfectly normal speech can rarely be produced. The artificial palate replaces the missing tissue. It is perfectly flexible and may be so adjusted as to be brought under muscular control, and this enables the patient to articulate with ease and naturalness.

FOR the Madagascar expedition France is constructing as fast as possible a flotilla of light draught gunboats and barges. Eight of the gunboats draw only sixteen inches of water and are 85 feet long by 17 feet beam. Four others are somewhat larger, with a draught of 24 inches. Engines and boilers are on deck and can produce a speed of six and a half knots. Each gunboat is armed with two one and a half inch rapid-fire guns, protected by armor plating.

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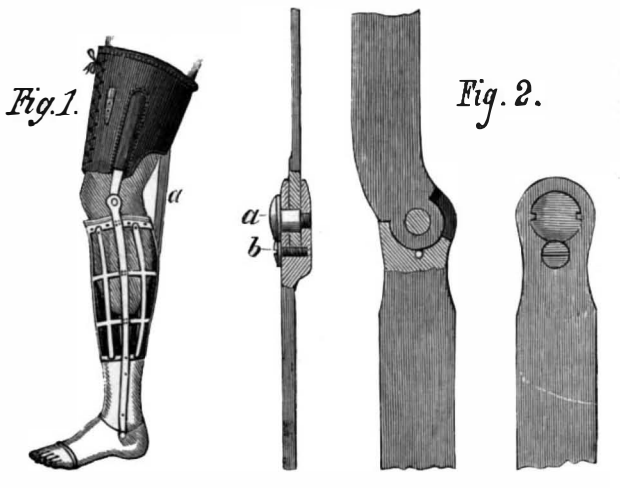
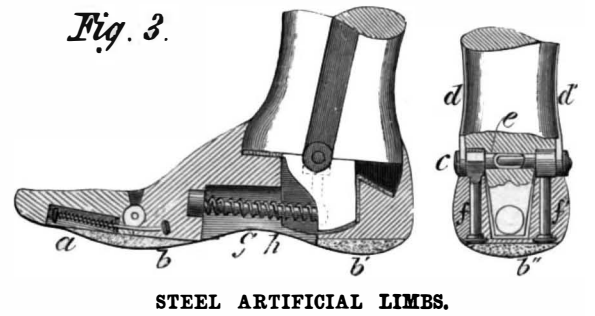
IMPROVED ARTIFICIAL LIMBS.

Rapid travel in the streets and suburbs of our cities, whether by cable cars, electric trolley or steam, is becoming more and more a necessary condition of modern American life, even though it be accompanied by an increased number of accidents. Although our war has long passed, cases of amputation are constantly being attended to in our hospitals. The electric motor and steam engine continue to make as many cripples as did the missiles of war, so that we have an army of mutilated men and boys in whose interests the highest mechanical skill has been invoked in the production of an artificial limb that shall imitate with precision the movement of the natural member. Very few of our readers probably are familiar with the internal construction and method of attachment of these appliances, which add so greatly to the comfort, moral and physical, of those who have been unfortunate enough to require their service. We give in the accompanying illustration details of construction of a steel skeleton leg manufactured by D. W. Kolbe & Son, of 1339 Arch Street, Philadelphia, Pa.

The principal conditions called for in the production of a false leg are strength, lightness and absolute reliability and freedom of movement at the joints, while at the same time the member must minister to the comfort of the wearer and must present a natural appearance while at rest as well as in motion.

The leather socket, as shown in Fig. 1, is made to perfectly fit the stump, and is firmly attached to a steel band shown at a. This socket, while comparatively rigid, has sufficient elasticity to give more comfort to the stump than is possible to obtain in the old style of artificial leg, where the stump is necessarily placed in a rigid wooden box. The open work of steel gives perfect ventilation to the stump, and its framework is cut from a solid piece of high grade metal and is without rivets, thus making it light and very strong. The knee joints shown in Fig. 2 have cast steel bearings and a take-up joint, so that any looseness is obviated by merely tightening the screw, a, which is clamped by the small screw, b. The foot itself, shown in Fig. 3, is novel and unique, and in its construction so little metal is used that its lightness is remarkable. The wood used is fine grained willow. The toe joint is entirely of wood and yet very strong, a result attained by making the rod of the under draw spring, a, of rawhide; this, together with the pure rubber cushion, b, gives ample strength to this joint and at the same time avoids the use of any metal to increase the weight, at a point where weight is most uncomfortable to the wearer. The ankle joint is made with a taper steel pin, c, which takes the steel straps, d, d', extending from the steel framework, closely fitted to square bearings, so that the pin is rigidly held in place to the upper part; the bearing, e, is of phosphor bronze, fitted to octagon holes in the bolts, f, f, which hold it rigidly to the foot. This ankle motion is controlled by the spring, g, which is held in place by a hickory pin, h. The pure rubber cushions, b, b', under the heel and ball of the foot, are the most recent improvement, relieving the jar from the stump and giving the natural elasticity to the wearer.





STEEL ARTIFICIAL LIMBS.

The entire weight of the leg complete is only five and a quarter pounds, and the action of the whole is so natural that in use it cannot be easily detected from the natural limb. This artificial leg is highly recommended by those wearing it, and particularly by those who previously wore the old style of wooden leg; among the latter is Dr. Mordecai Price, of Philadelphia, who has worn one of Kolbe's steel legs for the past fifteen years.

THE MICROGRAPH.

The micrograph is an interesting little instrument for showing a succession of photographic pictures, such as portraits, landscapes, statuary, paintings, and all kinds of notable objects. It consists of a case which carries a microscopic lens and also a transparent wheel or disk, on which the pictures are photographed; and the pictures are viewed by simply revolving the disk with the finger so as to bring the pictures successively under the lens, by which they are magnified or enlarged. The mode of using the instrument is shown in Fig. 1.

Fig. 1.

The full sized instrument is given in Fig. 2, from the side of which one edge of the picture disk is seen to project. Fig. 3 shows the picture disk itself. The case can be readily opened and new photo. disks put in, bringing thus other series of pictures. In this way the photographic representations of hundreds of remarkable scenes and objects may be preserved in a very small space, yet always ready for interesting study and examination. The micrograph is destined to become a very popular and useful instrument. Mr. F. W. Gardam, of 58 Ann Street, New York City, is the inventor and sole manufacturer. Patented in the United States and foreign countries.

Fig. 2.

Fig. 3.

Edward Swift's Comet.

The discovery of a faint comet by Edward, son of Dr. Lewis Swift, of the Lowe Observatory, Mt. Echo, Cal., brings once more to the attention of astronomers the lost comet of Di Vico. The earliest orbits of the Swift comet suggested that it was probably a periodical one, and some points of resemblance in its elements make it quite possible that it may indeed be that interesting object.

Di Vico's comet is the longest and least well known of the short period comets. It was discovered by Di Vico at Rome on August 22, 1844, and near the end of the month it became visible to the naked eye. It soon became evident that the observations could not agree with a parabolic orbit, and elliptic elements were computed by Brunnow and others, the period of the comet being established as 1,993 days. The next return was computed for 1850, but it was found that during its time of possible visibility its place would lie so close to the sun as to be overpowered by his light. The next return was fixed for 1855, but the object was not seen at that time or at any time since. It has therefore been known as Di Vico's lost comet. Le Verrier has shown that the comet was identical with that of 1678.

The orbit which was computed by Brunnow has not been forgotten by astronomers, and they have by no means given up the hope of finding it at some time. Finlay's comet in 1886 was supposed to be the lost one, but a close consideration of its orbit shows that it is not the same.

When the possibility of the identity of Swift's comet with Di Vico was known, the computers in this country as well as in Europe became at once exceedingly anxious to secure further data. In this the Europeans have had the advantage, for in this country not more than six observations are known altogether. This record is not a creditable one to American astronomy. It is true that this object is a faint one; at the same time it has been seen in a six-inch telescope at Lick and in a nine-inch, by Father Searle, at Washington. It is surprising that with all the large telescopes of the country the whole month of December should have to show only three or four American observations altogether. From this scanty data, Father Searle has computed a second and later orbit, but he is unable to prove positively the identity.

In Europe, however, Schulhof seems quite positive that the two objects are the same. He expresses his reasons in a late issue of the Astronomische Nachrichten, reasons which it is not necessary to repeat here. If the identity can be proved, there are several interesting matters connected therewith, and the discovery is of great importance. In the first place, the rediscovery of a comet lost for some fifty years is remarkable, and further it seems curious that the comet could have returned again and again to perihelion and yet not have been seen. In this latter respect, the information secured within the last few years is quite to the point, and Schulhof suggests that an outburst might have made it visible for a few days in 1844 at a brilliancy very much greater than its normal brightness. Several comets have been observed in such outbursts, more particularly the Pons-Brooks comet of 1888, the Brooks comet of 1889, and especially the Holmes comet of 1892.

Such is the story of the comet Edward Swift. It is the return of some comet, most probably that of Di Vico. It is most important to secure as many observations as possible; the more so, since in 1885 it must have passed very close to Jupiter and will be still more closely approached in 1897.—Boston Commonwealth.

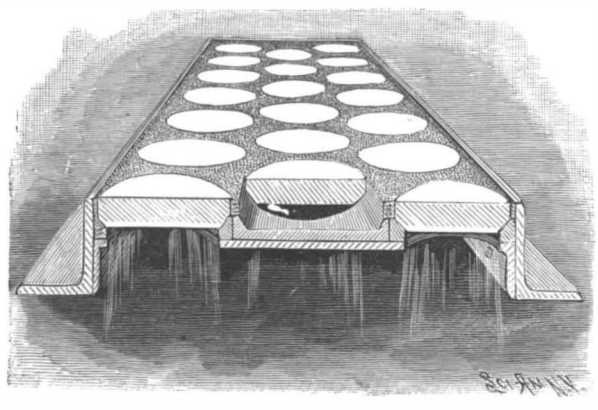
Mexican Onyx.

Mexican onyx has suffered a gradual decline in value for many years past. It is generally becoming known that Mexican onyx is not true onyx, but a species of marble. It is really an aragonite and is composed of calcium, oxide of iron and magnesium. The presence of these last two elements gives it its beautiful color. It is said the use of African marble and other cheap stones is replacing it.

Mexican onyx is easily worked and has been used not only for building purposes, but for ornamental household articles such as lamps, table tops, mantels, etc. It was used by the ancient Mexicans for masks, idols, and similar small objects. The price of all such articles has of late considerably decreased. Mexican onyx now sells in the rough at from $6.00 to $20.00 a cubic foot. Very large pieces bring more than this proportional price. When it is sawed into slabs, $2.00 per cubic foot is added to the price. The polishing, furthermore, greatly increases the value of the stone. In many cases there is a loss of 40 per cent of material in preparing it for wainscoting, so that the finished product is worth about $6.00 a foot. The material is too valuable to be used in places where it would be exposed to the weather.

AN IMPROVED VAULT LIGHT.

According to the improvement shown in the illustration, the framing or body of the vault light is composed of channel and angle irons, braced at special points by T, I, or angle irons, and the construction is such that the lights may be arranged in any desired order, each light being firmly held in position by one of the channel irons, and the spaces between the lights being easily filled with cement or other suitable material. A patent has been granted for this invention



CLOPP'S VAULT LIGHT.

to Mr. George B. Clopp, of No. 3028 Market Street, Philadelphia. The parallel flanges of the channel irons are tied together by bolts to form a rigid structure, and the connected irons are surrounded at the sides and ends by a frame of angle irons, whose vertical members are bolted to the marginal portions of the connected channel irons. The entire frame is braced and strengthened by another set of angle irons, and the frame and body are strengthened by T irons, which support the bottom portions of the channel irons, and are connected with the outer angle irons by brackets. This light is quickly and economically made, as all of its parts are stock material, so that it may be readily connected and built up for any situation where a vault light is desired.

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THE NEW TELEPHONE SYSTEM OF PARIS.

Despite its novelty, since the establishment of the first telephone lines dates back scarcely more than fifteen years, there are few industries of which we have had to record so numerous and so radical transformations as that of telephonic communications. These incessant modifications, of which it is difficult to see the end or even the retardation, are due in part to the special exigences of cities and states, in part to the unexpected increase in the number of subscribers and communications, and in part to the accessory services that are daily grafted upon the main service and peculiarly complicate the organism thereof.

The system, limited at first to a few subscribers not far distant from the center of the city, has become extended. It has been necessary to subdivide it by dividing the city into a certain number of districts, connected by an equal number of offices, which are themselves connected with each other by auxiliary lines arranged in a stellate polygon, that is to say, that permit of connecting any two subscribers in passing through two auxiliary offices at a maximum. After the city service, the progress made in telephony has permitted of rendering the communications interurban, and then, in a certain measure, international. Let us mention, too, the public telephone booths, the multiple subscribers on one line in common, the theatrophone, etc., which have, each of them, special exigences.

All these complications of service, the necessary consequences of the very success of telephony, have brought to the surface hard problems, of which the solution has not always followed the new needs with sufficient closeness. In many cases, even, such or such a rational solution has quickly lapsed into desuetude, and, until a new order, it seems as if a perfect telephone service of a nature to give full and rapid satisfaction to the public will constitute an ideal as irrealizable as the philosopher's stone and perpetual motion.

Such difficulties, upon which we cannot dwell too long, for the public is generally ignorant of their existence or does not sufficiently appreciate the importance of them, are particularly numerous at Paris.

The public and the administration have fallen into habits that they will renounce with difficulty and that naturally render the service more complicated and consequently less rapid.

In the majority of the large European and American cities, the subscriber is called up by the number of his apparatus. In France, we have still, and have had for a long time unfortunately, the call by proper name, with a telephonic population of from 13,000 to 14,000 subscribers, including one hundred mutations per week, a somewhat floating personnel, voluminous indices that are kept open with difficulty, etc. It will be seen that the researches in the index lead to loss of time or to errors, especially when one asks for Mr. Durand or Mr. Levy without specifying the title of the subscriber with the too common proper name in question. The calling up of the office by the subscriber and of the subscriber by the office is effected by a battery, while in other countries magnetic calls that lead to more simple arrangements are employed.

From another point of view, the use of exclusively subterranean telephone lines, generally placed in the sewer, increases the expenses of installation in a certain measure and complicates the surveillance and the search for defects. We speak of the double line only as a reminder, for, sooner or later, the development of the electric industry will oblige all the urban lines to adopt what is known as the double wire system, and from this point of view at least the Societe Generale des Telephones has, from the outset, given a good example by establishing all its lines according to this system.

After these general considerations, let us return to the telephone system of the city of Paris, a simple and rapid expose of the successive transformations of which may present a certain interest.

From July to September, 1879, scarcely three years after the discovery of the telephone, three companies asked for and obtained concessions for the organization of telephone lines exploited according to three rudimentary systems, but sufficiently different to render the putting of the three lines in communication impossible. Soon afterward, a fusion occurred, whence arose, on the 10th of December, 1880, the Societe Generale des Telephones, which, at the beginning of 1881, had 300 subscribers. A few figures will permit of forming an idea of the truly extraordinary development undergone by the telephone system since that epoch, and especially since the somewhat unfeeling acquisition of the service by the state in September, 1889.

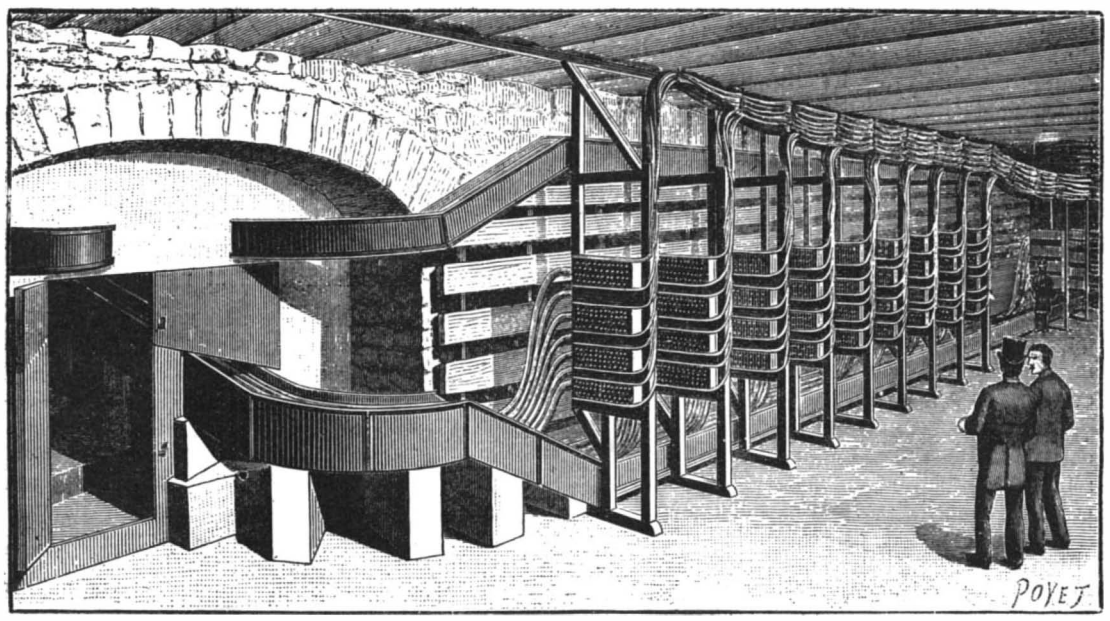

Fig. 1.—ENTRANCE OF THE CABLES OF 104 CONDUCTORS INTO THE CELLAR OF THE GUTENBERG STREET TELEPHONE OFFICE.

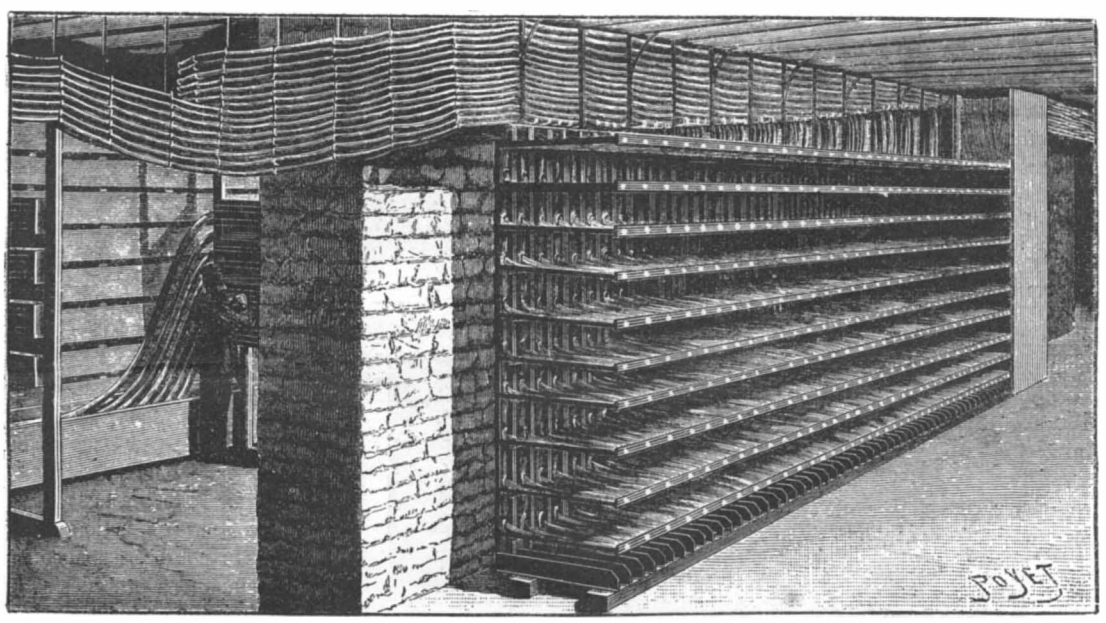

Fig. 2.—DISTRIBUTING BOARD OF THE TELEPHONE CABLES.

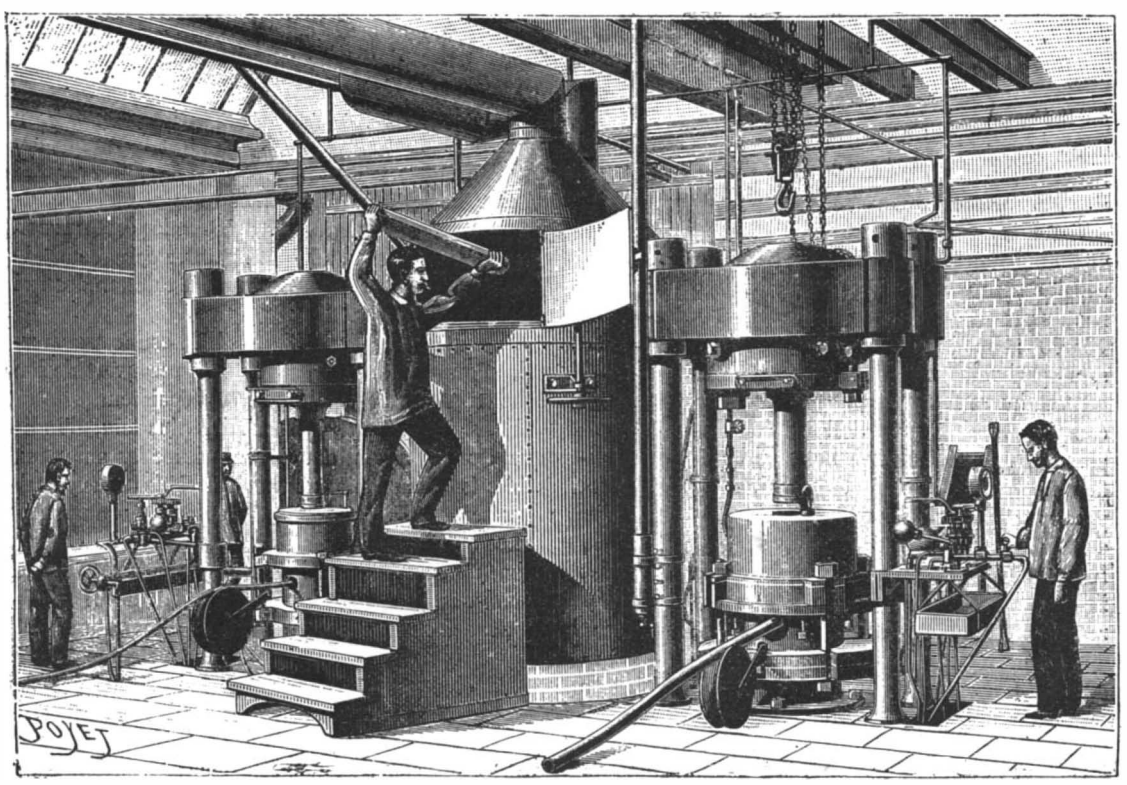

Fig. 3.—PRESS FOR COVERING THE TELEPHONE CABLES WITH LEAD.

At the end of 1880, the Societe Generale des Telephones had but 300 subscribers; at the end of 1881, the number had increased to 1,602, at the end of 1882 to 2,692, at the end of 1884 to 3,700, at the end of 1885 to 4,054, and at the end of 1889, shortly after the acquisition by the state, there were at Paris 8,306 subscribers, and, at the end of 1891, 9,635; while the figure that it will be necessary to put down for the beginning of 1895 will be 14,000, if it does not even exceed this figure.

At the acquisition of the lines by the state, the tax was reduced from $120 to $80, and this reduction led to so rapid an increase of the number of subscribers that it became necessary to entirely modify the processes and the communicating apparatus in order to respond to the requirements, which, it must be admitted, exceeded the resources of the art and which had not as yet manifested themselves so rapidly in any other city in the world, even in America, where, nevertheless, telephony had birth, but where higher tariffs, with good reason, curtailed the number of subscribers. We say with good reason, contrary to the general public opinion, for if, in large cities, the prices were low enough to permit from 150,000 to 200,000 persons to become subscribers to the telephone, the latter would no longer render any service, in consequence of the excess of the number and the slowness of the communications. The expenses of establishment, of maintenance, and of personnel would even no longer be covered by the receipts, since all the expenses sensibly increase as the square of the number of the subscribers, while the receipts, based upon a fixed tax, increase only proportionally. Sooner or later, and by the very force of circumstances, the price of $80 will become inadequate, and it will be necessary either to increase it or to make the budget support the deficit. The subscribers to the telephone will thus become new privilegees of the state.

In 1889, at the time of the forced cession of its system of lines, the Societe Generale des Telephones, which had about 6,000 subscribers in Paris, was exploiting this system by the aid of twelve district offices connected by auxiliary lines. We described this system in its time. Its principal advantage was that of reducing the mean length of the subscribers' lines in a great measure, but it offered the great defect of giving the largest number of communications in passing through two district offices, the direct putting in communication being so much the rarer in proportion as the offices were more numerous and as each of them served a

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smaller number of subscribers. The number of subscribers and the length of the line, on another hand, prevent the connecting of all the subscribers of a large city with a single central office.

A selection has therefore been made of a mixed combination, and, in the general plan of the new system, the district offices have been reduced to four only: (1) An office on Gutenberg Street, near the Halles, for the 6,000 subscribers of the center, and the one that we shall more especially describe; (2) an office on Wagram Avenue for 3,000 subscribers, which has been in operation for more than a year and does service for Auteuil, Passy, and the Batignoles; (3) an office on Belleville Street for 6,000 subscribers, for Menilmontant, La Villette, Belleville, etc.; and (4) a single office for the entire left bank, as yet in contemplation.

These four offices will be able to do duty for about 20,000 subscribers, plus the auxiliary, interurban, international and accessory lines that are ingrafted upon them. The number of subscribers at present is more than 13,000. The prophetic figure of 20,000 will probably be reached even before the four constructed or projected offices are completely finished. It will then be necessary (sad perspective!) to rearrange the line and to once again modify the system, which has already ceased to meet its object exactly and is no longer abreast of the new progresses of telephonic technics. The Parisian system is the tapestry of Penelope of our telephone engineers. The continuously renewed difficulties of the task that they have undertaken ought to render us particularly indulgent toward a service that is indisputably imperfect, but which, by its nature, could not even reach mediocrity in imperfection.

One will be able to obtain an idea of the complication of the system, of the precautions to be taken and of the difficulties to be overcome from a simple enumeration of the connections necessary to bring a subscriber's station to the board, and of the arrangements to be made in order that an accident (and the causes of accidents are numerous upon lines exclusively subterranean) may be quickly localized and repaired without the introduction of any trouble into the service of the other subscribers.

In order to simplify the explanation, we shall consider only the connections relative to an ordinary subscriber situated in the radius of the central office that does service for him. The double line of lead-covered wires insulated with gutta percha starting from the apparatus of a subscriber enters the sewer, where it meets other double lines with which it runs parallel as far as to a coupling box, which serves to connect seven subscribers with a 14-wire lead-covered cable insulated with paper. The first grouping is therefore made by sevens. Seven similar cables corresponding to 49 subscribers end at a cutting chamber whence starts a 104-conductor cable (52 lines). This chamber permits of making connections between the 49 subscribers and the 49 double lines. The three last double lines form a valuable reserve in case of accident to a wire of the 104-conductor cable.

These 104-conductor cables enter the central office directly.

The length of the two-wire cables connecting each subscriber with a coupling box is quite feeble. The mean length of the seven-subscriber cables (14 wires) at Paris is 1·2 mile, but it reaches as many as 3·5 miles for the most distant subscribers. The mean length of the forty-nine-subscriber cables (104 wires) is 5,250 feet, with a maximum of 2·4 miles.

The linear insulation required for the 104-cable conductors between each wire and the covering is at least 200 megohms to the mile, but, in practice, it reaches a much higher value, say from 10 to 30 times greater. Thanks to the construction of the cable, it is possible to blow into it air dried over chloride of calcium, which improves the insulation.

At A, in Fig. 4, is seen a transverse section of a 104-conductor cable covered with its $\frac{1}{10}$ inch thick leaden tube.

Before going farther, it will be of interest to point out the reasons that have caused the substitution of the new cables insulated with paper for the old lead-covered cables of the Societe Generale des Telephones.

The old cables insulated with gutta percha were formed of fourteen wires inclosed in a leaden sheath, whose external diameter was $\frac{8}{10}$ of an inch; the linear weight, 4 pounds to the mile; the linear resistance of each wire, 62 ohms to the mile; the linear insulation, from 400 to 5,000 megohms to the mile; and the linear capacity, 0·5 microfarad to the mile.

These cables presented several drawbacks. They were costly and had a great linear resistance, and especially a great electrostatic capacity. Moreover, they took up so much space in the sewer that they soon became cumbersome in the vicinity of the central offices, especially when the reduction in the number of such offices necessitated the introduction into each of them of a larger number of cables.

The present main cables are of the Patterson system, insulated with paper and without paraffine. Each conductor is formed of a copper wire 0·04 inch in diameter, surrounded with two bands of paper, the first of which is wound with a very long pitch in order to facilitate the passage of the air, and the second with a shorter pitch in order to maintain the first, which forms around the wire a sheath in which the air circulates freely. Two conductors are twisted with a pitch of 8 inches and then corded in regular layers wound in opposite directions, so as to form a very regular cylinder. The 104 wires (52 pairs) are afterward covered with a lead tube, of which the thickness is about 1·4 inch, and the external diameter but 2 inches.

The similar cable has a linear resistance of no more than 40 ohms per mile and 0 12 microfarad per mile of linear capacity (per wire), while its linear insulation reaches 6,000 megohms per mile, and may reach 12,000 and even 16,000 through the passage of a current of dry air.

The putting of these cables under lead merits special mention. The strand of the 52 pairs once finished is placed in a stove, where it is dried before reaching the lead presses. These latter, which are represented Fig. 3, consist of a hydraulic press whose piston exerts its pressure upon a piston that moves in a cylinder which is periodically filled with lead that has been melted in a furnace, such as is represented in Fig. 3, between the two presses for which it does duty. The molten lead introduced into the cylinder of the press is kept at a proper temperature by a row of gas burners which surround the cylinder. The cable is introduced through the back of the press into an ajutage of appropriate form and makes its exit through the front of the press. Through the play of the pressure alone the lead is introduced into the ajutage, becomes moulded around the cable and pushes it forward. The temperature of the lead is such that the paper is in nowise carbonized, and that on its exit from the press the lead covering is solidified.

Let us now return to the system of cables and wires of the central office. A central office for 6,000 subscribers thus receives 12,000 utilized wires and from 120 to 130 cables, without counting the auxiliary lines, designed to connect the various central offices with each other. The entrance of these cables at the office into large iron plate boxes designed to support them and especially to protect them against the gnawing of rats is seen to the left in Fig. 1. Each cable ends in a coupling box, a sort of cast iron case, the details of which are seen at B and C, Fig. 4. The 104-wire cable is introduced through one of the extremities of the box, and the wires, separated from each other, are attached to 104 terminals mounted upon the anterior wall of insulating material (Fig. 4 C). The terminals traverse the insulating partition and project from the front part (Fig. 4 B).

To these terminals are attached 104 wires forming two cables, of 52 wires each, and thus capable of doing service for 25 subscribers, the twenty-sixth conductor forming a reserve.

These wires leave the coupling boxes, as may be seen, for a part of the line (Fig. 1) and reach the distributer represented in Fig. 2. The distributer is an immense junction frame, the object of which is to permit of a direct putting in communication, without any other wire being touched, of any one of the 6,000 double conductors with any one of the 6,000 numbers of the office.

The object of this arrangement is easy to understand. The subscriber preserves the first number given him indefinitely, even when he changes his address, provided his new quarters be within the perimeter served by the same central office. This number corresponds to that of the board, and is not changed on the latter except in case of accident thereto. But we have seen that between the subscriber and the office there are interposed multiple junctions that permit of replacing any one of the sections of a line that has become deteriorated, and, particularly, of utilizing the spare lines of the 104-conducter cables. The object of the distributer is to permit of such changes of cables without a change of the subscription number or of a communication with the corresponding number of the central board.

To this effect, all the 52-conductor cables starting from the cable ends reach the upper part and the rear of the distributer (Fig. 4), and end at terminals mounted upon large uprights arranged upon the posterior face of the distributer. The double wires coming from the communicating board form cables of 42 wires, 40 of which do duty for 20 subscribers, the twenty-first forming a spare conductor. These wires are connected in front of the board, with terminals arranged upon horizontal bars methodically numbered by groups and by units.

The connection between any one of the cables and any one of the wires coming from the office is effected very simply by connecting the two pairs of terminals of a vertical bar (line) and of a horizontal bar (office) through a double wire. The inextricable confusion that would be produced by such puttings in communication and the frequent mutations that they necessitate is avoided through horizontal frames upon which the wires rest in running from the front to the back of the board, before ascending, descending and turning to the right or left in order to connect the conductor of the board with the conductor of the corresponding line. When a communication is suppressed the double connecting wire likewise is suppressed, and this renders both the number of the board and the corresponding cable free.

Finally, the following are, as a whole, the connections interposed between the subscriber's instrument and the central board: coupling box (from 7 to 50), end of cable (from 50 to 25), distributer (from 25 to 20). The 20 double conductors finally reach the telephone or multiple boards. We shall endeavor to follow them in a succeeding article.—E. Hospitalier, in La Nature.

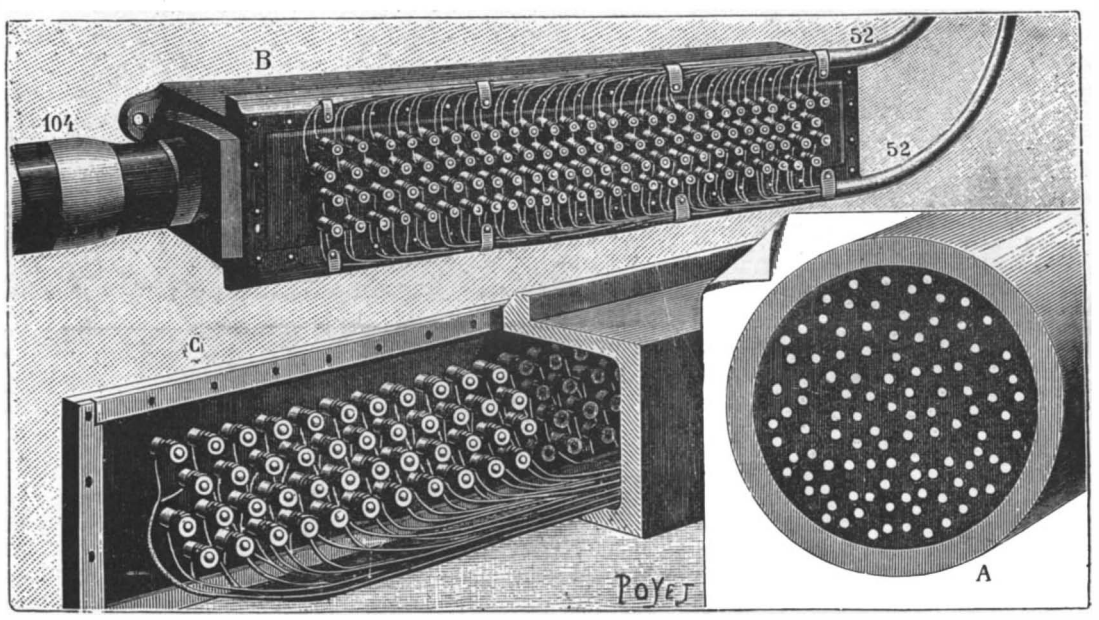

Fig. 4.—TRANSVERSE SECTION OF A 104-CONDUCTOR TELEPHONE TUBE (ACTUAL SIZE).

B. End of cable receiving the 104 conductors. C. Rear view and section of a cable head showing the entrance of the 104 conductors of the street cable.

Tea and Coffee Culture in Hawaii.

It is not generally known that the cultivation of tea and coffee in Hawaii is rapidly becoming a matter of importance to our American markets. Fine qualities of tea and coffee are being grown successfully and it may be expected in the near future that these islands will become an important source of supply. Both tea and coffee grow luxuriantly and both, it is noteworthy, are being prepared almost entirely by machinery, instead of by hand. This it is thought will compensate for the low wages paid to the pickers and other tea workers in China and enable Hawaii to rival the Chinese market prices. The tea, for example, is picked by machine, which gathers only the young and tender leaves and never makes the mistake of picking the tough leaves, however thick they may be. Next the leaves are withered, rolled and then packed without being touched by any hand.

In preparing the coffee berry for market there are also a number of ingenious and efficient machines which do the work much more cheaply and in a more uniform manner than it could be done by hand. The disk pulper and the Gordon pulper are principally used. Several of the Hawaiian coffee planters have erected extensive drying houses and a large crop this year may be readily prepared for market. The coffee plant grows luxuriantly on the island in almost every soil. Wild coffee has even been planted among the highlands and in the forests, in some cases at an elevation of over 2,000 feet, and gives an abundant crop. It is reported that this year a number of people are applying for land with the intention of raising tea and coffee and several large plantations are being equipped.

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Progress in Bacteriology.

"I believe," said M. Pasteur, many years ago, "that we shall one day rid the world of all diseases which are caused by germs." He has done much to prove his faith by his works, and so have others who are laboring in the same field. The latest achievement in that direction, the discovery of anti-toxin, appears to be one of the most important yet made. There are indubitable reports from European hospitals showing that the great claims at first made for it were not exaggerated. The use of it has cured a large proportion of cases of diphtheria, and insured immunity against the disease in others. Failures there have been, doubtless. But a comparison of the death rate among those treated with it with that among those not treated with it, but in all other respects similarly affected, satisfactorily demonstrates the value of the new remedy. And the disease thus dealt with is one of the most destructive. It has long been so familiar to us that mention of its name arouses no such horror as that of Asiatic cholera or smallpox or yellow fever. Yet its ravages, in this and most civilized countries, are incomparably greater than those of the three put together. Only two or three diseases endemic here surpass it in number of victims. A reasonably sure cure for or prophylactic against it will be one of the most beneficent inventions of modern medicine.

There seems to be reason to believe, also, that the recently devised system of inoculation against Asiatic cholera will be productive of good. It was pretty carefully tested this last fall in India, and the results have now been published. The disease was accidentally introduced into the Gaya jail, where there were 433 prisoners. Of these, 215 were inoculated. The remaining 218 were not. All were equally exposed, and, apart from inoculation, were treated exactly alike. During the first five days after inoculation no material difference between the two classes was observed. Among the inoculated there were 5 cases of cholera and 4 deaths; among the others, 7 cases and 5 deaths. The next three days, the sixth, seventh and eighth after inoculation, showed some contrast. Among the inoculated there were 3 cases and 1 death; among the others, 5 cases and 3 deaths, But after the eighth day the contrast was most marked. Among the inoculated there was not a single case of cholera, while among the non inoculated there were 8 cases and 2 deaths. It will be remembered that Dr. Haffkine said the inoculation would only be fully operative after about ten days. The actual results are two days better than he claimed. It would be premature to say that an infallible preventive against cholera has yet been discovered; but certainly this showing is significant. A third series of researches in bacteriology has marked the year. Hitherto no specific bacillus has been discovered in the lymph of cowpox or smallpox, and the failure to find it has raised some doubts concerning the validity of the germ theory itself. An elaborate series of experiments has convinced Dr. Klein that such a bacillus exists, and may be found if the lymph be examined at proper time. But at the time when the lymph is taken for the purposes of vaccination, the bacilli have already perished in the process of sporulation. Hence the lymph is found to contain no bacilli, but only spores. Dr. Klein believes he has discovered the actual bacillus, but his attempts to cultivate it have not yet succeeded. It is reasonable to expect, however, that these attempts will one day be successful, and the bacilli of smallpox, as are those of other communicable diseases, will be cultivated in an artificial medium, thus ridding vaccination of the most serious objections now urged against it.—New York Tribune.

New Foreign Postage Rates.

The new rates for foreign postage and registry have just gone into effect. The rate of letters to all parts of the world, excepting Canada and Mexico, will be 5 cents per half ounce. The rate to Canada and Mexico will remain the same as the domestic rates. Postal cards to all parts of the world will be two cents. The fee for registering a letter will be 8 cents, instead of 10 cents. Printed matter will be charged 1 cent per pound.

Correspondence.

The Russian Thistle.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to your article on the Russian thistle, issue of December 29, 1894, page 406, I would suggest the advisability of the government sending some one to the native home of the thistle to find such natural enemies as may be possible, either insect or fungoid. There must surely be one or both. The success of Koebele against scale and other similar work may indicate that even noxious weeds could be kept in check.

LINCOLN FOWLER.

Phœnix, Arizona, January 9, 1895.

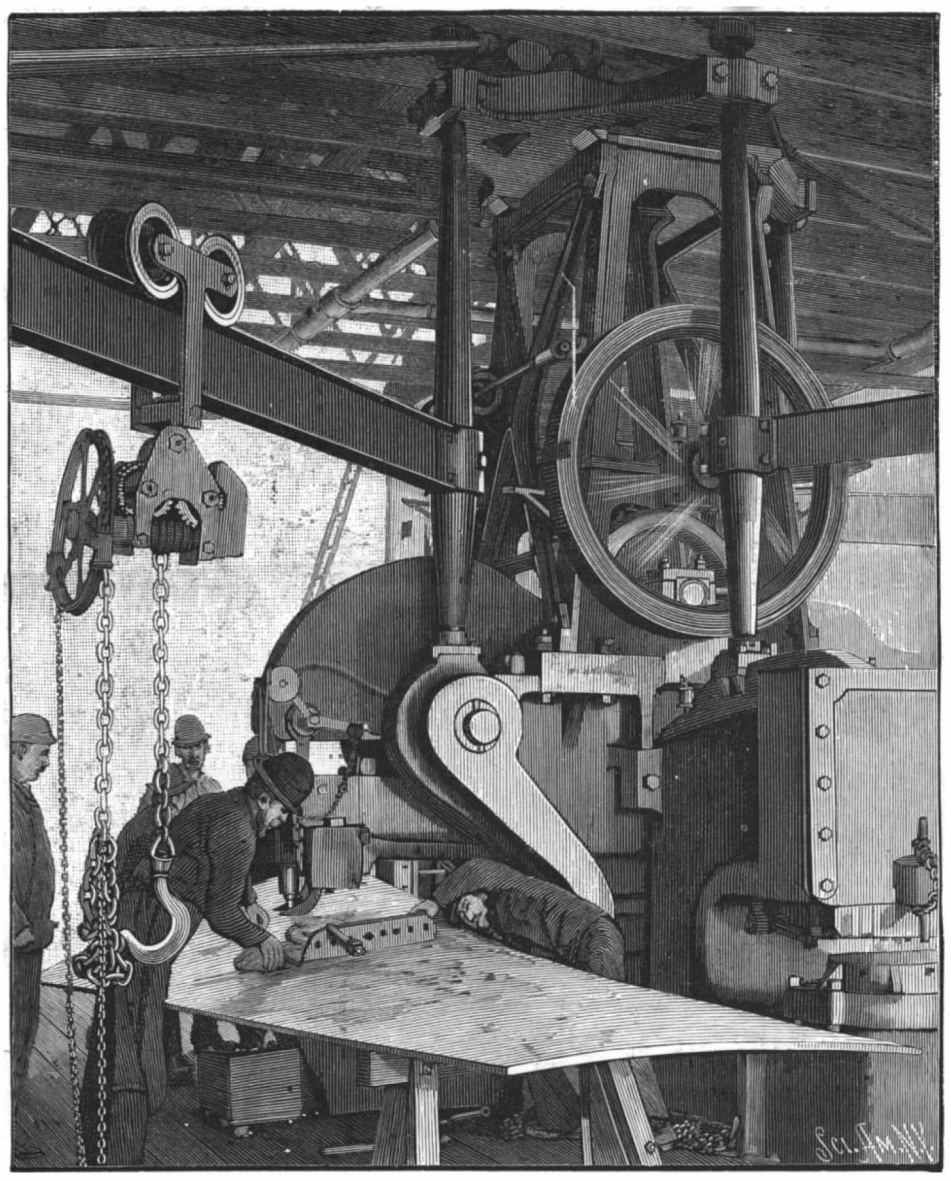
COMBINED PUNCH AND SHEARS.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of January 12, 1895, you give an illustration and description of a hydraulic punch used at Cramps. I would say that this punch [shown herewith] is not hydraulic, but worked by steam power, having an independent engine attached to the back of the punch. The engine makes some 170 revolutions per minute, the fly wheel of which is shown in your cut, that being the front. The machine is a combined punch and shears. That at the left of the illustration being a punch for rivets, etc., the punch in the front being for larger holes, and the shears being to the right, not shown in the picture, all of which are worked by the engine. The punch is thrown in and out of gear by a counterbalance weight, worked with a couple of ropes by an attendant.

STEPHEN P. M. TASKER, JR.

Cramp Ship Yard.



COMBINED PUNCH AND SHEARS.

Dyed Grasses.

If natural dried flowers are scarce, the void is filled by the many beautiful grasses now used to so large an extent. Foremost is the Vera grass, with its bold and striking tree-like plumes, now very largely imported and dyed in various tints—salmon pink, canary, autumn tints, a combination of red, orange, golden brown, shades of green, pink, and magenta, the newest being heliotrope, as fashionable in artificial flowers and grasses as in those of nature; and next in importance is the Pampas grass in magnificent plumes, undyed and dyed in various colors. Some novel Japanese and African grasses are strikingly handsome; the latter are from the Congo, some in rich, dark colors, and some delicately silky; they include the "Elephant" and "Congo" reed grasses. Barley and oats are seen dyed in very pleasing colors, one being a bright bronze. Eulalia, Bromus, Briza, Erianthus, Lagurus, Panicum, and others, with dyed forms or the feather grass in abundance.

Artificial Illumination.

The Lancet, London, has lately investigated the relative merits of the various systems of illumination now in vogue, among them the incandescent gas light system of Welsbach. The following are the results: The incandescent system of electric lighting must, of course, rank first from the point of view of health, since it affords a soft, agreeable light, without giving rise to any vitiation of the air; there is no combustion, and, consequently, there are no products of combustion, complete or incomplete. From the same point of view we are bound to place next, in the face of the result of our present inquiry, the incandescent gas light in its improved form. It is even less productive of carbonic acid gas than the average oil lamp, and consumes not quite one-half less gas than the existing type of burners, giving rise, therefore, to the evolution of half the heat and half the amount of carbonic acid gas, while its illuminating power expressed in candles is more than three times as great as the best ordinary gas burners or the incandescent electric lamp, each of which does not generally exceed 16 candle power, unless a very great expense is no object to the consumer. We are far from saying that the incandescent system of gas lighting has attained to the highest pitch of perfection; still, we are well within bounds when we regard it as the system of gas lighting which utilizes most efficiently and most economically the full powers or duty of coal gas as an illuminating agent. Some have expressed fears that the burner is a delicate instrument—much too delicate—for the part it is destined to fulfill; but we have found with ordinary care—and care is well worth a little exercise in view of the enormous advantages the system affords—that these fears need not exist. We understand that in practice the average life of a mantle, taking risk of breakage into consideration, is between three and six months, but the mantles have been frequently known to last over a year, at the end of which time their lighting efficiency was still good. One more important point, already slightly touched upon, is that, in spite of its high illuminating powers, this burner does not require a gas possessing any special illuminating value itself; and as it is the maintenance of a high illuminating value which contributes in a large measure to the cost of coal gas, the general adoption of the incandescent system of gas lighting would probably lead to the production of a cheaper gas, possessing little illuminating power, but adapted equally well for the incandescent gas burner, which would then contrast more favorably with coal as regards cost for heating purposes. The production of a cheaper gas since the introduction of the incandescent system of lighting has, we believe, engaged the serious attention of engineers, chemists and others, and we may expect to hear more on this important question before very long. To hygienists this is an extremely important aspect of the incandescent gas system, inasmuch as it is obvious that the introduction of cheaper gas, by its more extensive employment for fuel, would tend to free London from the reproach of being a city which, during the greater part of the winter, is enveloped in vilely suffocating fogs. There is, therefore, we think, a future for the new system of far-reaching importance to the community.

Ornamenting Glass.

A new method of ornamenting glass has been discovered recently by Gorlitz, of Zurich. The method is not a very expensive one and the results obtained are said to be very beautiful. The design to be reproduced on the glass is first engraved on "positively" on a printing plate of rubber, and this plate after being coated with varnish is pressed against the glass. The glass is then covered with bronze powder or other suitable material. The portions forming the design will remain empty and therefore transparent. The glass is then placed in a frame which has a backing of strong paper board, over the front of which is mounted a bright sheet of tinfoil or tin plate. It will be seen that the design will therefore be shown by a reflected light through the transparent portions of the glass, while its other parts will form a background stamped in relief. The common plan for producing enameled writing and designs in relief on glass has been to apply enamel paint by means of a brush.

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THE ELECTROPLATING OF THE HULLS OF IRON SHIPS.

Paints and compositions innumerable have been tried to prevent marine growths from forming upon iron and steel vessels below the water line. Mr. Theodore D. Wilson, late chief naval constructor, says, "Thousands of dollars have been expended in the testing of protective and anti-fouling paints and compounds with very little encouragement to further experiments." The process of Mr. Thomas S. Crane, of East Orange, N. J., patented May 30, 1893, controlled by the Ship Copper Plating Company, of New York, has just been put to a practical test in coating the iron hull of an ocean tug 98 feet long with copper to the thickness of one-twentieth of an inch. The tug is being treated in a dry dock in Jersey City, but it is expected to coat new ships before they are launched, to save the expense of docking and loss of time.

The destructive effect of barnacles on the hulls of the ocean liners and war vessels is well known. Some idea of the saving in cost by using the new process may be gained from the statement of Philip Hichborn, the U. S. naval constructor, in his report to Congress, in which he says that to dry dock, clean, and paint the cruiser Chicago in any port would cost about $12,000, and that on the average it would be necessary to do this three times a year, making $100,000 for a three years' cruise. Only a short time ago one of our war ships burned 1,000 tons more of coal on her homeward trip from Rio than on her journey there, and her speed was two or three knots less per hour because of a foul bottom. From the hulls of the Alert and Atlanta twenty-five tons of barnacles and incrustations were removed. Some of the foreign navies resort to the cumbersome method of covering the vessels with planking, which is in turn sheathed with copper. A coating of copper will keep barnacles off the hulls, and will also prevent the pitting and corrosion to which iron and steel vessels are now subjected.

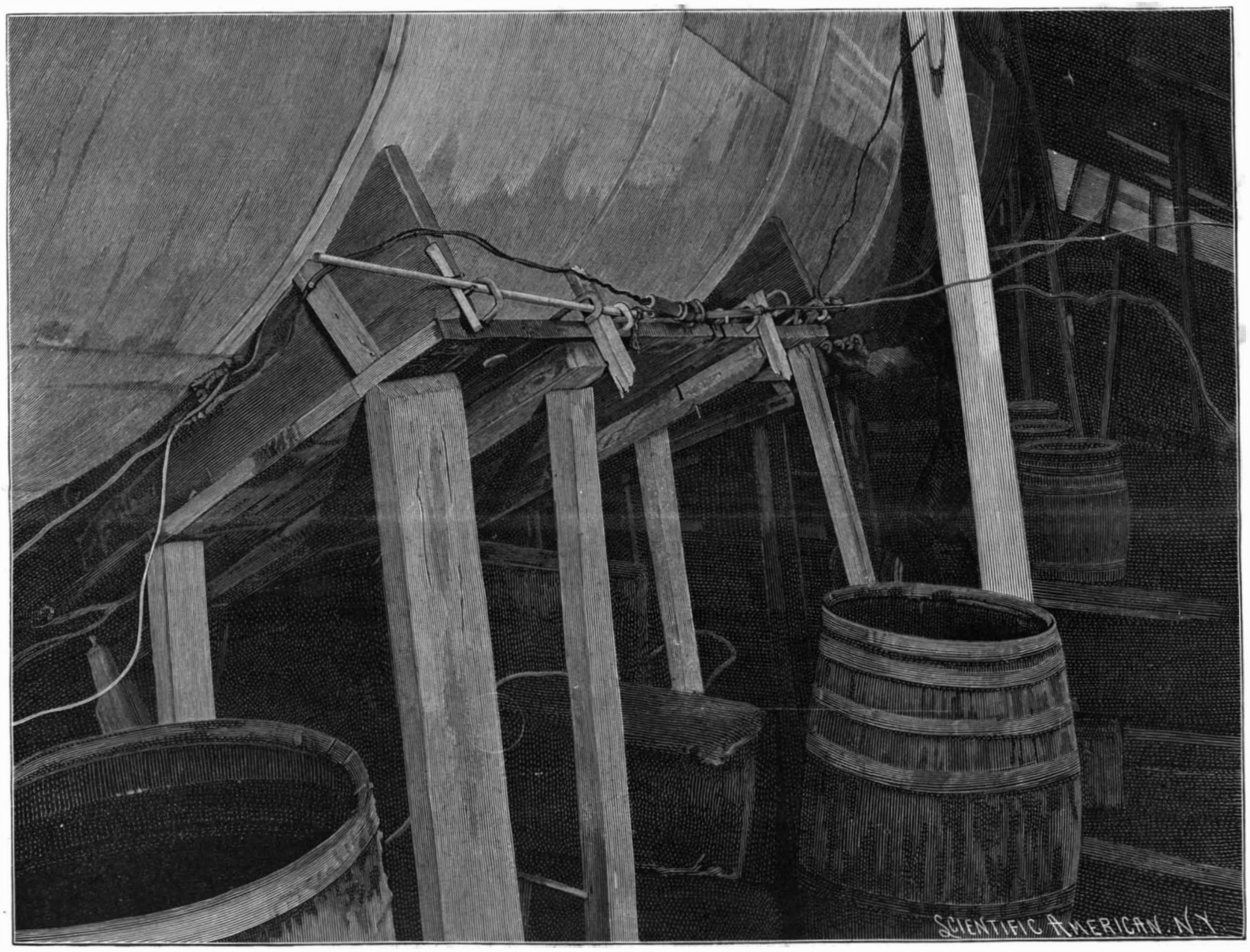
By the new process, which we illustrate, the copper is electrically deposited in sections upon the surface of the vessel in successive rows, and the joints of the sections are overlapped during the electro-deposition in such a manner as to perfectly unite the whole coating of the vessel. The entire surface below the water line, including the riveted laps of the steel sheets, the keel, the stern and rudder post, are thus protected by an unbroken metallic sheet of copper. The baths are open upon one side, which is applied to the hull of the vessel, and our illustration shows the bath actually applied to the hull of the tug Assistance while supported upon blocks in the dry dock.

The method is a triple one. The bath, which in size is about five feet square, is securely placed in position, and after being shored up against the vessel's bottom, is calked around the edges with cotton and oakum till it is water-tight. Then it is filled with strong acid solution for twenty-four hours, which cleans the plates. The acid bath is removed, the spot washed thoroughly, then the wooden bath is filled with a solution of copper cyanide, and a current of six volts and 900 amperes is applied. The action of the cyanide solution is two-fold—it assists in cleansing the plates and also causes a firm film of copper to adhere in the next stage of the process. The cyanide bath is removed after having been allowed to act for twenty-four hours, and a solution of copper sulphate is substituted. Large copper plates are used as anodes; the current is reduced to three volts and the amperage remains the same.

The deposition of copper takes place immediately, and the process continues until copper has been deposited to the thickness of $\frac{1}{20}$ to $\frac{1}{16}$ of an inch; the current is then stopped, and the bath removed. The deposition of the copper usually requires about four days. The coating is closely adherent, and cannot be removed except by chipping with a cold chisel, in which case a portion of the iron usually comes away with it. The lapping of the coatings has been already described. There is no chance for galvanic action to set in except by a blow or grinding upon a rock which might cut through the film. But after such a blow the vessel would undoubtedly have to be docked for repairs and a small bath could be applied to recopper the defective spot. The plating of propellers will be of particular value, as the least bit of corrosion interferes seriously with their efficiency. Of course in practice a large number of tanks or baths would be in use, and it is expected that an ocean steamer of the largest size (600 feet long) could be completely plated in four weeks.

Experiments have been made on the copper coating, using sea water which has been brought from ten miles out at sea; it is found that this water has no effect on the coating. To Mr. Henry Bergfels, the plater of the tug, much credit is due in the way of overcoming difficulties, which naturally arise in a new undertaking of this description. It is now expected that an elaborate plant will be built to accommodate vessels of large size if the Assistance proves to be all right in actual sea trials. The success of the plating stage of the process is assured, and all that is now needed to demonstrate the success of the process as a whole is a test in actual service to see if the coating has the permanency which there is every reason to believe it possesses.

Our engraving is from a photograph showing one of the electro-plating baths in operation, as applied to the bottom of the tug Assistance as above described.



THE ELECTROPLATING OF THE HULLS OF IRON SHIPS.

The Cost of Electric Transmission of Power.

At a recent meeting of the North of England Institute of Mining and Mechanical Engineers, at Newcastle, Mr. Alex. Siemens, president of the Institute of Electrical Engineers, read a paper on "The Cost of Electric Transmission of Power." He said that some time had elapsed since Lord Armstrong and Sir William Siemens installed electricity for this purpose, as well as for lighting, at their respective residences at Cragside and Tunbridge Wells. Those applications of electric transmission were perfectly successful, though it was only lately that the transmission of electric power had been taken up in earnest. First of all electric tramways were developed, and their rapid extension was sufficient proof that reliable electric motors could be erected and would work reliably and without trouble. There was a belief in the minds of some people that an electric motor cost about as much for repairs as a steam locomotive did for coal. His firm had electric motors on tramways which had run 60,000 miles without any repairs whatever. If they made a motor sufficiently strong, so that it could do its work comfortably, it would not use up the brushes. Mr. Siemens then described the system of electric transmission in use in the works of Messrs. Siemens Brothers & Company, at Woolwich, which has been put in to succeed steam power. He said the works were lighted from the same currents. If engineers introduced electric power for pumping or hauling in mines, they could use the same mains for lighting purposes, and they would find it worked perfectly well. Having given the result of careful experiments as between steam and electricity, he said there could be little doubt about it that for new works electric transmission was the cheaper. Whether a change from the old system to electric transmission could be recommended could only be decided by the local circumstances. As a rule, electric transmission was most valuable where power was required to be transmitted to various and distant portions of the works, and especially in such places as mines, etc. By the conversion the colliery owner would save sufficient to repay the outlay in ten years. In other words, the cost of erecting the plant for the year would be less than the present cost by an amount equal to 20 per cent of the outlay.

LORD KELVIN holds that the internal heat of the earth has nothing to do with climates. The earth, he says, might be of the temperature of white hot iron 2,000 feet below the surface, or at the freezing point 50 feet below, without at all affecting a climate.

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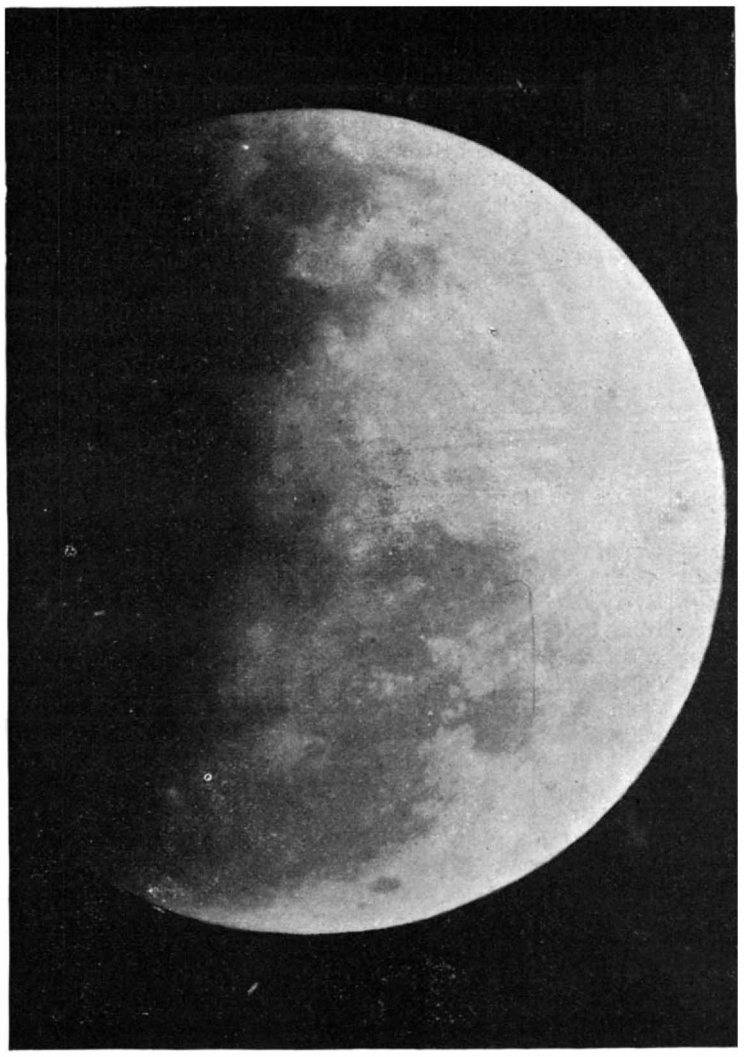
PHOTOGRAPH OF THE PARTIAL ECLIPSE OF THE MOON, SEPTEMBER 14, 1894.

The accompanying photograph of the partial eclipse of the moon on September 14 and 15, 1894, was made with the 10 inch equatorial refractor of this observatory, with photo connecting lens placed in front of the visual objective. The diameter of the moon's image in the principal focus is about one inch, which is enlarged by a positive photographically corrected enlarging lens to four and one-half inches. This enlarged image is taken direct in the telescope at the time of exposure.

The time of exposure for this negative was two seconds. The driving clock of the telescope was regulated to lunar rate, so that the moon's motion was accurately followed.

This photograph was made at the time of greatest obscuration, or half past eleven, and shows the diffused circular outline of the earth's shadow.

WILLIAM R. BROOKS.
Smith Observatory, Geneva, N. Y.



THE RECENT PARTIAL ECLIPSE OF THE MOON.

The Interstate Commerce Report.

The eighth annual report of the Interstate Commerce Commission, which recently appeared, deals with the year ending June 30, 1893. At that time there were 176,461 miles of steam railways in the United States open for traffic. This was an increase of 4,897 miles for the year. The total number of persons employed by the railways was 873,602, or about one in every seventy inhabitants of the United States. Notwithstanding the comparatively small mileage added during the year, 52,187 new employes were taken on during the same period. This increase may be attributed to the large number of additional men required for signaling purposes, for workers in freight yards and for porters in passenger stations. Since June, 1893, nearly one-third of the entire railway mileage of the United States has been in the hands of a receiver. The gross capitalization of the railways of this country was reported as $10,506,235,410, or at the rate of $63,421 per mile. These figures do not seem excessive when compared with the capitalization of the English railways. Some years ago it was estimated that the railways of England were capitalized at a rate of $185,000 a mile. A receivership on an English railway, especially for a trunk line, is not of frequent occurrence, so that we can safely assume that a part of the responsibility rests with our State laws, which fix rates too low to be profitable, and federal laws, which prohibit railways from making agreements among themselves to reduce unprofitable competition.

REPAIRING CHINESE WAR SHIPS.

In our issue of January 12 we described the great battle of the Yalu River, the most important naval engagement since the advent of iron and steel in shipbuilding. We now illustrate the repairs which were made to one of the vessels of the Chinese navy, which had been riddled with shot from Japanese war ships. After the retreat, the remnant of the Chinese fleet steamed away toward Port Arthur, the Woolwich of China, to make repairs. Port Arthur, where many of the vessels engaged in the Yalu battle were put in a seaworthy condition, was afterward taken by the Japanese.

The Chinese admiral opened the Yalu engagement on September 17, 1894, at a distance of about 7,000 yards. The firing at the outset was indifferent, but the Japanese gunners improved their aim as the distance began to lessen. The Chinese barbette ship Ting Yuen was the first to suffer any severe injury, a Japanese shell bursting in her battery. Two of the big guns of the battle ship Chen Yuen were disabled and she was left defenseless, except for her secondary battery. She had 120 shot holes in her sides when she steamed away. The Ching Yuen was soon riddled with shells. The Chao Yung ran ashore and became a target for the Japanese gunners until she was set on fire. The King Yuen was in a terrible plight. A shell burst through her deck and she slowly foundered. In the Chih Yuen nearly all the woodwork was burned away and there were 200 shot holes in her, mostly from machine guns, before she sank.

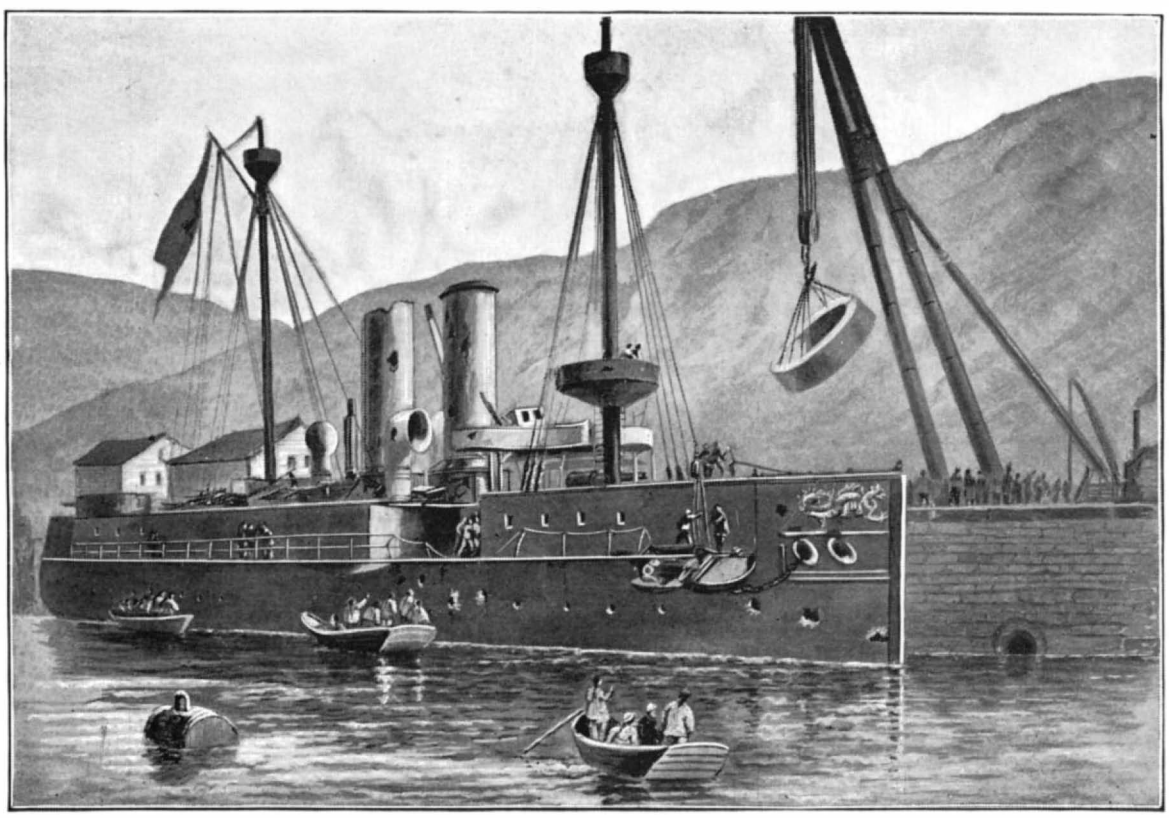
The Japanese cruiser Yoshino threw 3,750 pounds of projectiles a minute, able to pierce any but the thickest armor. The scene during the heat of the conflict was appalling. The fusillade swept away masts and funnels, shattered conning towers, pierced the gun shields and the hulls. Above the armored deck all was reduced to total wreckage. The battered ships with gaping sides were kept from foundering by the steam pumps, which were constantly at work. When dusk came, the vessels, listing badly, steamed slowly away. When the contending fleets separated, it is believed that they were both short of ammunition. The greater part of the damage inflicted to the Chinese vessels was done by shot, and not by ramming or torpedoes.

The details of the condition of the vessels during the conflict was terrible. Some of the foreign officers on the vessels of the contending fleets give sickening accounts of carnage. One of them expressed an opinion that if the European rulers could have seen the condition of the decks of the Chen Yuen, they would have forsworn war forever. A shell glanced from the steel deck of the Chen Yuen and went through her conning tower, shattering everything. A lieutenant was in the act of speaking to the engineer; he was blown to pieces and his head was left hanging on the speaking tubes. The woodwork in nearly all of the vessels was very much splintered and inflicted many painful wounds. In the first meeting of the Chinese and Japanese sea force, near Chemulpo, on July 12, the details are even more horrible. On the Yang-wei everything was a ruin. The funnel had been shot away to within four feet of the deck. As forced draught was used, the men rigged a jury stack of sheet iron and canvas supported by a derrick. A hose was kept playing constantly on this makeshift funnel to prevent it from taking fire or melting. Down in the boiler room naked coolies shoveled coal for dear life; gin was as free as water for them, and whenever a man lagged he was urged on with blows from a thick club made of rubber belting. The draught was so intense that a continuous sheet of flame poured from the funnel. The main deck was a lake of blood an inch thick. Floating in the deeper parts were fragments of bodies, and here and there a writhing human being whose tortures were not yet ended. Whenever a man was found hopelessly wounded, the surgeon gave him instant relief from his agony. He carried an atomizer filled with prussic acid, and when a man was found who was fatally injured, he sprayed the poison into the man's mouth and nostrils. The dying men craned their necks forward eagerly to escape the torture they suffered. The shattered remnants of humanity were thrown overboard and the vessel, with gaping sides, steamed to Shanghai.

Many nautical authorities are of the opinion that the work of the Japanese navy is the most successful since the time of Nelson. Captain Mahan thinks that nothing in the engagement will point to a remodeling of war ships, but it will certainly largely affect their equipment. The 66 ton guns of the Japanese fleet did good work, but it was not the large guns, which will send a 750 pound shot through the best armor made in Europe, but the rapid-firing guns which decided the battle by turning the decks into shambles and destroying gun mounts, stacks, fighting tops and conning towers, as well as riddling the hulls.

One battle cannot, of course, determine all the questions of naval construction, but the teaching of the battle of the Yalu seems indisputably in favor of swift cruisers armed with rapid-firing guns.

The conflict seems to have definitely decided that woodwork is out of place in war vessels. Baron von Sterneck de Ehrenstein, the chief official of the Austrian navy, says, in speaking of the Japanese cruisers being able to hold their own against the Chinese ironclads: "This fact has opened the eyes of the great powers, and induced them to give greater attention to the construction of cruisers in the future."



CHINESE WAR SHIP AFTER THE YALU ENGAGEMENT.

A Bridge of Concrete.

A concrete bridge having a clear span of 164 feet and 26 feet wide was recently constructed over the Danube at Munderkingen, in Austria. Stone is scarce and dear there, while good Portland cement is produced in large quantities. The centering was covered with oiled paper, on which the concrete was laid, consisting of 1 part cement, 2½ parts sand, and 5 broken stone, all thoroughly mixed. Blocks of this concrete have shown a resistance of 187 tons per square foot in seven days, 235 tons in twenty-eight days, and 308 tons in five months. The concrete was applied in layers 12 inches thick, starting at the abutments and working toward the crown, where it is 3¼ feet thick; midway to the crown it is 4½ feet thick. The time spent in laying the concrete was only nineteen days, and ten days after the centers were struck. The deflection proved less than 4½ inches.

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THE BOULEVARD LAFAYETTE, IN THE CITY OF NEW YORK.

We have already described and illustrated the Harlem River Driveway, extending along the edge of the Harlem River from 155th Street to the north, and terminating at Dyckman Street, near the north end of the island, a road designed to provide a speedway for horses. While this work has been going on, which is destined to result in the development of a magnificent park region along the banks of the Harlem River, a similar work of equal or greater importance has been in progress, and is now nearly completed, on the west side of the island of New York, along the banks of the Hudson River. The backbone of New York is, to a great extent, primitive gneissoid rock, and the shores of the Hudson River, in many places precipitous as those of the Harlem, are composed largely of this formation. Starting at the intersection of the Boulevard on the line of the Eleventh Avenue, the Boulevard Lafayette, the work to which we have alluded, runs westerly a short distance and then, turning to the north, winds along the bank of the river, high above its level, until, in the neighborhood of Inwood, it turns to the east and intersects Dyckman Street. Most of the work upon it is done, and next summer, it is believed, will see it completed.

By an act dated June 15, 1868, what is known as the Boulevard, corresponding to the old Bloomingdale Road, was designated as extending from Fifty-ninth to One Hundred and Fifty-fifth Street. By an act of June 18, 1873, the Boulevard was ordered to be opened and widened from One Hundred and Fifty-fifth Street to the present Dyckman Street, 100 feet being assigned as its maximum width. An ordinance dated October 16, 1891, empowering the Department of Public Works to do the work, went before the Mayor and was approved. The law empowering the Commissioner of Public Works to open the Boulevard to any width within the 100 foot limit appears among the laws of 1891, chapter 219, and the name of Boulevard given by an act of 1870 to this portion has been changed to the Boulevard Lafayette, a most appropriate name, on account of the revolutionary associations of the region.

The bird's eye view shown at the foot of the cut gives the general course of the road, and shows how, connecting with Dyckman Street, it will lead to the northern end of the Harlem River driveway. But this is not all. At the point of connection of the Boulevard Lafayette with Dyckman Street, the old Bloomingdale Road, or Broadway, a fine macadamized boulevard, passes, leading to Kingsbridge, Yonkers, and the country north thereof, and running south to the city. Then between Broadway and the Boulevard Lafayette is another boulevard, known as Fort Washington Avenue, so that a number of circuits and openings and outlets are provided irrespective of the Harlem Driveway.

Starting at about 155th Street on the south side and winding through Audubon Park, the view at the upper right hand corner of the cut shows what may be termed the opening of the new Boulevard. It soon reaches the river, and our other views are drawn at different points along the line. Some are drawn looking north and others looking south, the river, which lies to the west of the Boulevard, showing how each view faces. The 100 foot width has been included in the survey, but owing to the expense, the road for the present has been made but 60 feet wide. This 60 feet, however, has been measured in from the western line of the survey, so that any future widening will be done by cutting into the hillside toward the east, the level of the road being definitely fixed by the present operations, and the retaining walls being adapted for the ultimate widening. In some parts the ground is exceedingly steep and rocky, and along the western edge at many places a high retaining wall has been built, laid dry and to a batter of three inches to the foot. The roadway proper has been given a uniform width of 40 feet. As the bottom or foot of the retaining wall marks the western limits of the 100 foot space, it is obvious that the area available for the sidewalk varies. In some places, where the wall is 45 feet high, the batter alone occupies over 10 feet of the width which the sidewalk would otherwise have. The sidewalk space, therefore, varies from 10 to 20 feet. In order to get filling and stone for the wall, the contractor availed himself of the fact that the 100 foot width was at the disposal of the city and cut into the hillside for filling, so that in many places the excavation has practically reached the 100 foot limit without the city having to pay anything extra. The sidewalk will be curbed and flagged and the roadway be left as a first-class dirt road, so that a speedway will really be available and at the service of the horsemen of the city within a few months.

The views from the road are superb. From its retaining wall and western edge a precipitous woody and rocky hillside descends to the river edge, along which wind the tracks of the Hudson River Railroad. Then the waters of the Hudson River, at this point about a mile wide, extend to the Palisades, which rise from three to five hundred feet, a most impressive feature and one which is to be hoped will be soon protected by legislation from destruction by blasting. Near the southern end of the Boulevard, beginning at about 170th Street, a city park is to be established. This embraces the area approximately bounded south and north by 170th and 183d Streets, and bounded on the east by the Boulevard and on the west by the river. It includes Fort Washington Point, seen in the bird's eye view projecting to the west into the Hudson River, one of the most picturesque spots on the island. This park is destined with its long water front to form the most beautiful of our city parks, but the three miles of the Boulevard Lafayette alone will almost represent a park. The unexcelled beauty of its views can only be judged by actual inspection. Those conversant with the driveways of other cities here and abroad say that the Boulevard Lafayette is the most beautiful boulevard in the world. From one point upon it the Hudson River can be seen running northward as far as Tarrytown. We hope later to recur to the subject.

The work has been in direct charge of Mr. W. M. Dean, superintendent of street improvements, and has been executed by Mr. Rhody McLaughlin, contractor.

Periodical Comets Due in 1895.

BY W. T. LYNN, B.A., F.R.A.S.

Two comets of short period are due to return to perihelion in the course of the present year, but whereas one of these, which is in view while we write, has been seen at no fewer than twenty-six returns and consecutively since that of 1818–19, when it acquired its name from that of the illustrious astronomer who investigated its motions and calculated its orbit, the other has hitherto been seen at only one appearance.

The first comet is, of course, our old friend Encke, which was first discovered by Mechain, at Paris, on the 17th of January, 1786, and first seen the present appearance on the 31st of October, 1894, at Nice, being then in the constellation Pegasus. very near the place predicted for it in the ephemeris of Dr. Backlund (Astronomische Nachrichten, No. 3,263), who, we regret to notice, states that this is the last time that he will be able to undertake its calculation. The comet, he finds, will pass its perihelion on the 4th of February; the last time it was in that position was on the 18th of October, 1891, on which occasion it made one of its very near approaches to the planet Mercury.

The other comet due in 1895 was discovered at its first appearance on the 16th of July, 1884, by Prof. Barnard, now of the great Lick Observatory in California, but who was then at Nashville, Tenn. Although thus discovered in the northern hemisphere, the comet remained throughout that appearance in the southern. Dr. Gill and his assistants afterward obtained a number of observations of it at the Cape of Good Hope, and it was also observed at Melbourne and other places, but was always very faint and difficult of observation. Its orbit was determined by Herr Berberich to be one of short period, amounting to only about five and a half years; but its position at the return expected in the winter of 1889 was exceedingly unfavorable, and it was not seen. Another appearance will be due in the summer of the present year. Herr Berberich calculates (Astronomische Nachrichten, No. 3,260) that it will then be somewhat brighter than at the return when it was discovered in 1884, and that its perihelion passage will probably take place on the 3d of June. Its distance from the sun, when least, is nearly equal to that of Mars.—Knowledge.

Phonograph versus Graphophone.

A decision was rendered in the Supreme Court of the District of Columbia on December 24, in the suit which had been pending for nearly two years, brought by the American Graphophone Company, nominally against the Columbia Phonograph Company, but the real parties defendant being Thomas A. Edison and the Edison Phonograph Works. It was alleged by the American Graphophone Company that the original Edison tinfoil phonograph was a failure, as the sound records it made were not accurate, permanent, nor capable of being reproduced as often as desired, could not be detached from the machine, handled, and transported, and that the art as now known was created by the inventions of Alexander Graham Bell, Chichester A. Bell, and Charles Sumner Tainter, who began their work under the auspices of the Volta Laborator Association, and whose patents were afterward acquired by the American Graphophone Company, and that every phonograph, every phonograph cylinder, and every phonograph record became practical and valuable only so far as it relied upon the principle of engraving the record as distinguished from the abandoned method of indenting, used in Edison's original tinfoil phonograph. No testimony was taken for the Columbia Phonograph Company in the case, and when the time limit fixed by the court had almost expired the defendant withdrew counsel and allowed a decree by default. The court finds for the American Graphophone Company on every point, issues a decree of injunction against the defendants, and orders an accounting by the auditor of the court. Other suits are pending in New Jersey, New York, Ohio, Massachusetts, Illinois, and Kansas.

Curious Foods of the Fishes in the New York City Aquarium.

The work of providing suitable food for the many varieties of foreign and domestic fish in the New York City Aquarium makes a very curious and interesting study. The food provided is as nearly as possible like the food the fish eats in its natural free state. The fish are fed once a day at a regular hour. The live food is placed in the tanks and is soon captured by the fish, and the dead food is thrown into the pools as required and the part not used is afterward taken out to keep the pool clean. It is found necessary to have as much variety as possible in fish foods, since the fish are very fastidious in their diet and often refuse to eat the food offered them.

The live food consists of clams, shrimp, killies, crabs, and a variety of small fish. Clams are used in large quantities, being cut up into sizes to suit the fish. For sharks and such large fish live menhaden are placed in the pools. The skate and the dog fish eat large snails, the striped bass are fed on soft crabs. The smaller fish require especially prepared fish. If clams are fed them, for instance, they have to be cut up into mince meat or else carefully scraped. The sea anemone, for instance, are fed on crabs and the soft parts of oysters, and it is necessary to place these particles of food on forks to place them within the anemone's reach. The sea horses are especially delicate feeders, and great care is taken in preparing their food. A minute crustacean is sometimes put in their tanks. Shrimps are also used at times for this purpose. They must be perfectly fresh, however, and be served with the greatest care to make it resemble the sea horse's natural food.

The barnacles are provided with a net which they move through the water to secure their food, and are also very particular in their fare. The juice of clams or oysters is usually fed to them by dropping it in the water directly above them. The barnacles subsist on the fibers of the mollusk. The smaller crustaceans are fed with very small pieces of young hermit crabs, snails, lobsters, etc. The coral polyps and other very small varieties are fed in a similar way. Great care is always exercised to provide the best quality of food and to vary it so as to make it appetizing to the fish. The work of feeding and the antics of the fish while eating are well worth watching. The feeding hour is indeed by far the most interesting part of the day in the great aquarium.

Lucifer Match Inventor.

It has been generally believed, and we gave the statement some years ago in the Leisure Hour, says the editor, that the invention of lucifer matches was due to Mr., now Sir Isaac Holden, M.P., who still survives as one of the oldest members of Parliament. This was in 1829, as we then said. In boyhood, before that time, a little bottle of phosphorus in a case was the ne plus ultra of invention, and was used instead of the ruder flint and steel with tinder, either for domestic purposes or for the surreptitious midnight feasts of schoolboys.

It turns out that the real inventor was John Walker, an apothecary of Stockton, two years earlier, in 1827. In a lecture in the Borough Hall of Stockton on "Methods of obtaining light and fire in all ages and among all nations," Mr. Parrott, the lecturer, exhibited the old shop book of Mr. Walker for that year. It was shown that a box of lucifer matches, getting light by friction, was sold in April, 1827, to Mr. Hickson, a solicitor, for 1s. 3d.

So important is the discovery deemed that an influential committee is formed to erect a statue to John Walker. Sir Isaac Holden is an honorary member of this Stockton committee, stating, when nominated, that he was not aware of the priority of invention. Other claims have been made in France and Germany, but the honor or good fortune certainly belongs to John Walker, who died in May, 1859, aged 52.

It was the beginning of a most wonderful movement in history, art, and commerce. Think of the superstitious awe with which, not in Jerusalem alone, but throughout the nations who are ignorent of the invention, is hailed the "miraculous" light obtained from lucifer matches! How vast the wealth derived among civilized races from the manufacture of "safety matches" of all kinds! A memorial plate has meanwhile been fixed on the site of Mr. Walker's old shop in the High Street of Stockton.

Tons of Caterpillars.

Thirty-six tons of caterpillars and a large number of cocoons were destroyed in the effort to drive the pest from the young plantations of trees on Hong-Kong Island. They appeared on the pine trees with which the government is trying to reafforest the island, and lasted for two months. Stations were established where the caterpillars were received and paid for by weight; this method seems to have been successful. It is estimated that 35,000,000 insects were killed.

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The American Voice.

Why is not as much attention paid to the pleasure to be derived by way of the ear as the eye? In this country we treat the ear barbarously. The ear gets the minimum of pleasure, and it retorts by aggravating the nerves. And so it happens that much of the discomforts of our life come through the ear. What the foreigner most notices in this country, until he becomes, as we are, more or less callous to it, is "noise." We are not simply pitched on a high key nationally, but on a discordant key. It is not a gayer or more animated country than some others, but it is noisier. Certainly we do not cultivate harmony or moderation. To begin with, the "American voice" has an unenviable reputation. It is apt to be shrill, strident, high-pitched, unmodulated. This quality adds an unnecessary aggravation to social life. It disorganizes the nerves, and increases the tendency to nervous prostration—this and the other unchecked noises. The human voice ought to be a delight; it was meant to give musical pleasure.

There is no good reason why the American voice should not give pleasure. The voices of uncultivated races are often delightful. The negroes set us a good example in agreeable tones. That there is no radical incurable defect in the American voice we know, because we have had orators whose tones were as musical as the organ and the flute; there are communities where we hear for the most part modulated, low, and pleasing speech; and it is getting to be admitted that an American singer is the peer of any in the world. But in general no care is taken about the voice in speech. Girls as well as boys are permitted to make home discordant and school a babel of mere noise by the most vulgar and rasping use of the vocal organs. Mrs. Browning might have written, with us in view, a more pathetic poem on the "Cry of the Children." If children ought ever to be whipped, or, to put a case more in consonance with the tendency of the age, if children ought ever to whip their parents, the castigation should be given for the harsh, piercing, and discordant voice. It is idle to say that this sort of voice is natural to them. Any voice can be cultivated to a degree that it shall not be unpleasant, and this education should go on from infancy in every home and every school. It is a matter of public interest for the public pleasure. Think what a tea party might be!

The voice is, however, only set to the pitch of the other noises. In all thickly settled communities the ears are split and outraged by the steam whistle of the factories and the locomotives. In the depths of the night the startled sleeper has the veil of seclusion torn away from him by the scream of the whistles, the invalid's excited nerves are worn to rags by the barbarous pipe of the locomotive. We skringe and suffer with only faint protest. It is only a part of the universal noise and hubbub. Most of this screaming of the steam demon is absolutely unnecessary in this day of clocks and watches and guarded railway crossings. But if we must have the whistle, why not invent one that is moderately musical instead of being a torture? This is a suggestion of quiet-loving people, who find the noise of our American life every day more intolerable. Perhaps any abatement of it would not suit the majority, who like to go tearing and whooping through the world.

It is fortunate, considering our voices, that we are not Moslems, for then we should substitute for the muezzin's melodious call to prayer a harsh summons that would frighten every sinner back into his bed, and compel him to stop his ears against the rasping invitation to devotion. But is it altogether fortunate? For have we not the church and other jangling bells? These give out noise and nerve-shaking clamor instead of melodious notes. There are few bells in the United States that are agreeable to the ear. The foundries seem to go on the idea that anything in the shape of a bell will answer the purpose, with little or no regard to its tone, and we are called to church with the same metallic anger that invites us to a fire. The manufacturers are probably indifferent because the public are indifferent. Their products are mechanical, and only by chance musical. There is the need of art in the making and ringing of a bell, as in the making and playing of a piano. We appear to be content with any mass of metal cast in the bell shape, and to let a ringer with the instinct of a blacksmith evoke its dissonance with a sledge hammer.—Charles Dudley Warner, in Harper's Magazine.

Work in High Altitudes.

Some curious facts were brought to light on the capabilities of men to labor at high altitudes during the construction of the Peruvian Central Railroad. This line starts at Lima, and proceeding inland, reaches its highest point at the tunnel of Galeria, 15,645 feet above sea level. It is stated that men were able to do a fair "sea level" day's work as long as the altitude did not exceed 8,000 to 10,000 feet above sea level; but beyond this there was a sudden falling off in the work of one-fourth to one-third up to heights of 12,000 feet, and at still higher elevations 100 men were required to do work easily done by 50 at sea level.

A PNEUMATIC BICYCLE BRAKE.

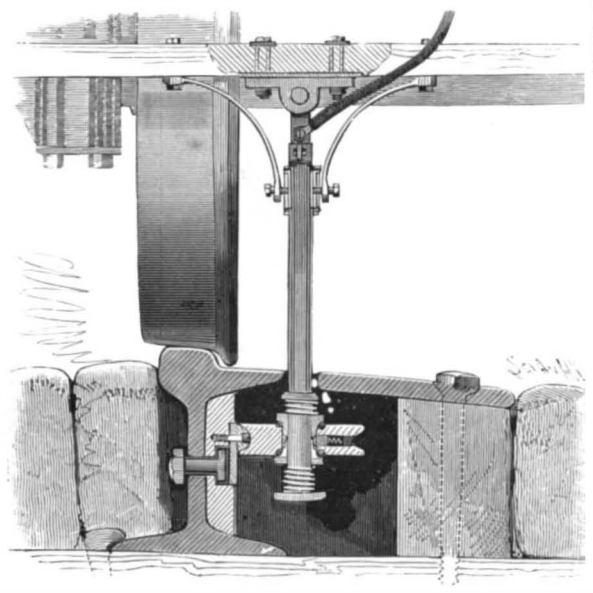
An extremely simple and inexpensive brake, with which pressure may be immediately brought to bear on the wheel by operating a hand bulb, provision being also made for instantly releasing the pressure, is represented in the accompanying illustration. It forms the subject of a patent recently issued to Dr. Wm. B. Wallace, 144 East Sixtieth Street, New York City. A portion of its structure is out of sight in the hollow frame of the machine, its supporting plate being bolted to a flange of the steering fork, in the upper portion of which is held the usual slide tube connecting with the handle bars. To the under side of the supporting plate is hinged a plate carrying a concave shoe adapted to bear against the wheel tire, the hinge plate being normally raised by a spring, connecting it with the

WALLACE'S PNEUMATIC BICYCLE BRAKE.

supporting plate, while between the two plates is an inflatable bag connected by a tube with a bulb which partially encircles one of the handles of the handle bar. The tube is elastic, but has a rigid section, to enable the length of the inflating tube to be adjusted to suit the height of the slide tube. The brake is applied by repeated squeezing of the bulb, producing air pressure in the bag or flexible reservoir above the plate carrying the brake shoe, the air pressure being removed and the brake released by opening an ordinary escape valve at one end of the bulb. The device may also be used as a hydraulic brake, and may be applied on vehicles other than bicycles.

AN ELECTRIC RAILWAY CONDUIT.

In the conduit shown in the engraving one side is formed by one of the rails, and the trolley arm is so arranged that it will have the necessary flexibility and still be sure of making a positive contact with the line conductor. The improvement has been patented by Mr. Albert M. Burgher, Clay City, Ky. The opposite



BURGHER'S CONDUIT ELECTRIC RAILWAY.

side of the conduit is formed by a timber laid parallel to the rail, a guard plate being secured to the top of the timber, leaving a slot between it and the rail for the trolley arm, while a strip of wood coated with insulating paint is bolted to the web of the rail. The heads of the bolts are covered by insulating blocks, against which is secured the line wire, having a flattened face and rounded outer side. The trolley arm is pivoted at the top to have a limited lateral movement in a bracket insulated on and rigidly fastened to the truck frame, the portion of the arm lying adjacent to the conduit top being coated with insulating material held in a casing. On the opposite sides of the casing are recessed wear plates which receive screws in the ends of curved springs rigidly attached to the truck frame, and pressing with equal tension on opposite sides of the trolley arm, holding it perpendicularly, and yet permitting the car and arm to have the necessary movement in relation to each other. The hub of the trolley wheel is held on the trolley arm between springs, to provide for the up and down movement of the car, the wheel being grooved to fit snugly on the line wire, and provided with ball bearings, while, to insure a perfect contact, it has a radial bore in which is held a copper plunger, the inner end of which is held in close contact with the hub by a spring. In front of the trolley arm is carried a guard, hung in the same way, to brush aside any possible obstruction. The improvement is designed to afford an inexpensive and efficient substitute for the present overhead trolley systems.

The Color of Horses.

Mr. W. H. Hawkes writes to the Australasian as follows on that vexed question, the color of horses:

"It is an old saying among horsey men, 'a good horse was never a bad color,' and yet popular prejudice assigns all sorts of good or evil traits of character to particular colors. I can quite understand this with those who do not know better; but that an expert, like an Indian buyer, should hold to the popular fallacy is almost beyond belief, seeing that we have had innumerable instances, both in the old country and here, to the contrary. It was recently that some four or five races were won in one day upon one of our local courses by chestnuts, and I think the fact was mentioned by one of your contributors, and they are equally good either in saddle or harness. Yet there are numbers who will condemn a chestnut at once for his color only, be he ever so perfect in every other respect. The objection to a gray one can understand from a groom's point of view, seeing that they are so difficult to keep free from stains as age whitens their coats, but for no lack of good constitution or disposition.

"Some will tell you that a roan is the hardiest of all horses, and yet I venture to assert that a greater portion of aged roans does not exist.

"Others credit black horses with being allied to the devil himself for temper and untrustworthiness. The only objection to him is that he is very rusty in his winter garb.

"'White legs are always a sign of weakness,' you are told by many. But I think three to one would be fair betting against the one white leg out of a set of four, the others being black. What about Odd Stockings and All Fours? Surely if white legs were a sign of weakness, such horses should break down at a very early stage of their career. Most judges prefer bays with black points, and it would be difficult to beat them for general appearance the year through, but I for one should certainly deny to them a monopoly of sound constitutions, tractability, intelligence, and all other virtues. I am quite with Mr. Basil Gray in his general remarks, but even he errs the other way, as he credits white legs with being indicative of some peculiar virtue—or, as he says, they always denote quality.' This I very much doubt. That skillful breaking and future wise education has most to do with the character and usefulness of a horse, as well as a man, irrespective of his color, can, I think, he accepted as a settled fact. Renfrew was a splendid tempered horse until teased to such an extent that he became a man-eater. Many a two-legged brother has had his character spoiled by those who should have helped to make him better. That horses, like men, have their temperaments goes without saying. That an eye for the beautiful leads fanciers to reject piebald, skewbald, and horses with wall eyes and big blazes for hacks or carriage purposes is not to be wondered at. But that any should condemn many of our really beautiful chestnuts is an enigma.

"The objection purely to color is, I think, much akin to the action of one who crosses himself when passing in the street a person with oblique vision."—Bell's London Messenger.

Cheap Street Car Fares in Philadelphia.

The reduction of fare by the trolley cars to Germantown to 5 cents and to Wissahickon and Manayunk to 8 cents furnishes two very practical illustrations of the benefit to the public of the introduction of the new street car motor. One reduction was inspired by competition and the other appears to have been a concession to a popular demand, possibly expedited by a desire to anticipate steam railroad competition. Under the reported traffic agreement between two lines occupying the chief streets lying immediately west of the Delaware, it is probable that with the opening of spring passengers will be carried from any part of the city to any of the principal entrances of the East and West Park for a single fare. It is equally probable that the competition of rival lines will result in single fare transportation to Frankford in the northeast and Darby in the southwest. That many people now residing south of Lehigh Avenue will seek homes farther from the heart of the city may be surely counted on, but the sections abandoned for residence purposes will probably be occupied for business purposes. This was the effect of the introduction of the old street cars. The introduction of the trolley has more than doubled the possible residence area of the city.—Philadelphia Times.

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Zinc to Bleach Molasses.

The adulteration of New Orleans molasses with sulphate of zinc is again attracting attention. The same question has been brought before the trade in various forms within the past ten years, but reports from various sections of the country now indicate a more vigorous investigation of the methods being practiced by New Orleans and other shippers. According to a member of the New York trade, nearly 95 per cent of molasses received in this market is adulterated; but, on the other hand, it is explained that it is hard to sell straight goods, and that molasses is brightened so that it will sell more readily. It is denied, however, that the introduction of sulphate of zinc is injurious, and to substantiate this several houses that deal in large quantities of molasses contend that zinc not only brightens the goods, but purifies it. At any rate, the proportion of zinc used, they say, is so small that it is harmless.

It is claimed for the zinc that it has peculiar properties which allow it to precipitate all foreign matter, and rise to the surface as a scum, which is then cleared off and the molasses is left a pure amber color. The fact that molasses is "bleached" in order to compete with New Orleans wholesalers was freely admitted in the local trade.

It was said that the New Orleans Board of Health had prohibited the use of sulphate of zinc in the adulteration of molasses, and for some time the practice ceased. The manufacturers of preserves, etc., declared that the enforcement of such an order would practically ruin their business; but nevertheless it was heeded until recently, when fresh complaints were made to the health authorities that sulphate of zinc was entering into the clarifying process of molasses more largely than ever.

Mr. H. L. Hobart said in reply to inquiries: "There is nothing in the story worth discussing. Zinc is used to purify and brighten molasses, but not in sufficient quantities to harm anybody. It is an old matter often before the trade, and that's about all there is to it."

Mr. Post, of B. H. Howell's Son & Co., replied: "Sulphate of zinc is one of the ingredients used in a formula to clarify molasses, but I don't believe enough of it is used to injure anybody. The adulteration can only be detected by an analysis. There are houses in this market that brighten molasses. I believe that the zinc precipitates any foreign matter which the molasses may contain, and then rises to the surface, where it is recovered. I don't think enough remains to harm us."

A member of the firm of Gustave Jahn & Co. answered: "Yes; sulphate of zinc enters into the clarifying process of molasses. We have a formula for brightening our goods, but it is a common practice in the trade. Very few straight goods are received from New Orleans, and when we do get straight goods it is difficult to dispose of them when shown with brightened goods. It is a miserable practice, however, and I wish it could be stopped."

A dispatch from Columbus, Ohio, states that a plan of adulterating New Orleans molasses came to the attention of Dairy and Food Commissioner McBall, of Ohio. A very extensive dealer in molasses and preserves sent him two samples of the classes—one bleached and the other unbleached. The manufacturer in question stated that this "bleached" article is the unbleached with sulphate of zinc added. The zinc is poisonous. The manufacturer in question said he had been forced to "bleach" his sirup in this manner in order to compete with the New Orleans wholesalers, who first inaugurated the process.—N. Y. Journal of Commerce.

Four Hundred and Twenty-four Degrees Below Zero.

Four hundred and twenty-four degrees Fahrenheit below zero! Just what this means it is almost impossible to imagine, and, yet, it is one of the temperatures which have been reached and used in laboratory research, and has been made the subject of some highly interesting experiments and explanations by Prof. Dewar before the British Royal Institution. Four hundred degrees below zero is not an everyday temperature, nor can it be reached by more everyday means than the expansion of liquid air, which latter Prof. Dewar has succeeded in producing in comparatively large quantities, and in storing by novel and ingenious methods, to be used as required in the study of matter at abnormally low temperature, exactly as a spirit lamp or a Bunsen burner is used in studying the properties of different bodies at the higher temperatures.

The tensile strength of iron at 400° below zero is just twice what it is at 60° above. It will take a strain of 60 instead of 30 tons to the square inch, and equally curious results have come out as to the elongation of metals under these conditions. It was an idea of Faraday that the magnetism in a permanent magnet would be increased at very low temperatures, and experiments with comparatively low temperatures had rather negatived Faraday's suggestion, but Prof. Dewar has completely verified the opinion of the famous savant, having shown that a magnet at the extremely low temperature made possible by the liquid air had its power increased by about 50 per cent.—Cassier's Magazine.

Work of the Cold Spring Harbor Hatchery During 1894.

The fish hatchery at Cold Spring Harbor, Long Island, has done much good work during the year 1894. This hatchery is probably the most prominent and efficient of the seven stations of the New York Fish Commission. During the past year it has turned out 33,250,000 tom cods and 22,500,000 smelts, which have been liberated in the harbors on the northern shore of Long Island. There have also been some 300,000 trout placed in local streams and in the Adirondacks. About 100,000 salmon and 700,000 shad have been sent to the head waters of the Hudson, and 500,000 lobsters have been freed in Long Island Sound.

At present the propagation of trout engages most of the time of the hatchery. The spawn this year number 1,500,000 eggs. Besides this interest, much is being done to supply adequate quantities of tom cods, and at present there are 60,000,000 tom cod eggs in the hatchery in various stages of incubation. One of the most important results of the year has been the experience gained concerning the propagation of lobsters. The 500,000 lobsters raised last year were from spawn taken from females captured off Sound Beach, Connecticut. Superintendent Mather believes, however, that in a few years lobsters will be cultivated as easily as trout.

A Microscopical Exhibition.

The eighth annual exhibition of the Department of Microscopy of the Brooklyn Institute of Arts and Sciences was held in Art Association Hall, Monday, Jan. 14, 1895. The exhibition was one of the most successful ever held under the auspices of the Institute, eighty-six microscopes being used, the visitors passing from instrument to instrument. The present officers of the department are: H. F. Calef, president; H. S. Woodman, vice president; A. H. Ehrman, secretary; C. P. Abbey, treasurer; James Walker, curator.

RECENTLY PATENTED INVENTIONS.

Engineering.

INJECTOR. — Benjamin M. Throop, Geneva, Ohio. This injector has a steam inlet and a water inlet connected by a set of lift nozzles with an interior compartment, while forcing nozzles connect the latter with the outlet, there being a double valve arranged in the casing and adapted to connect the steam inlet with the steam nozzle of the set of forcing nozzles, and the interior compartment with the outlet to the boiler. The construction is very simple and inexpensive, and may be easily operated to force water under either normal or increased pressure to the boiler.

BOILER BRACE.—Peter McGregor, Chicago, Ill. The body of this brace is preferably of light, flat metal, having one end slitted to form two members, which are twisted and semicircular in cross section, diverging laterally, and having their ends bent outwardly to form opposite outwardly extending feet. The improvement is intended as an inside brace for the heads or other flat surfaces of the boiler, and is very simple and inexpensive while yet having great strength.

Railway Appliances.

CAR COUPLING.—Carman Frost, Hewlett's, N. Y. This is an improvement on a formerly patented invention of the same inventor, providing a gravity coupling dog which will automatically couple with an opposing drawhead, a spring being applied to the coupling dog to insure its returning to its coupling or normal position and remaining straight. A section is combined with the drawhead section, the two sections being side by side, and so located that the line of draught will be immediately through the center of the drawbar and the center of the coupling proper.

CAR COUPLING.—Edward C. Inderlied, Rock Rift, N. Y. This invention consists principally of a link adapted to engage hooks on the opposing drawbars and means for raising and lowering the link to engage or disengage the link with or from the drawbar hooks. Cars of different heights may be readily coupled with this coupling, the several parts are positively connected with each other, so that none are liable to be lost, and the coupling or uncoupling is easily effected without the trainman going between the cars.

TIE AND RAIL FASTENING.—Ellery C. Davis, Crookston, Minn. This is an improvement in metallic ties and rail fastenings, according to which the tie is channeled and a flanged inverted chair permanently secured to it, both having coincident bolt holes and one of them having lateral slots, flanged and notched clamping bolts being used, engaging a detachable locking device. For use on curves, the bolt holes of the ties and chairs are located at different distances, and the improvement is designed to afford the maximum of simplicity, strength, cheapness, and durability.

Electrical.

CLOSED CONDUIT FOR ELECTRICAL RAILWAYS.—Frank Windle, Philadelphia, Pa. Spring plates, to be depressed by the trolley, extend beneath the slot of the conduit, according to this improvement, a conductor in the conduit being insulated from a longitudinal support, while springs in contact with the conductor have upwardly curved arms with which the spring plates engage. The conduit may be very shallow, and the contact strips are held normally out of circuit, but are pressed automatically into circuit by the passage of a car, so that only certain sections of the strips are energized at any one time, thus rendering the system very safe and preventing any great loss of energy.

RAIL FOR ELECTRIC ROADS.—Charles Sill, New York City. This is a rail upon which the cars may travel in the usual manner, while it also affords a housing for the electric conductor and trolley wire. The rail has a base from which extend upward two parallel webs upon which is bolted a top plate forming the rail tread, the rail thus affording a longitudinal duct for the conducting cable, while from the duct lead apertures to a recess in the rail carrying the trolley wire.

Mining, Etc.

APPARATUS FOR TREATING ORES.—Norris H. Cone, Leadville, Col. This is an apparatus more especially designed for roasting and chloridizing gold, silver, copper and other ores. It comprises a revoluble cylinder on the inner face of which are arranged pipes communicating with a main gas or air chamber, a stationary cut-off covering some of the pipes, whereby they will be successively closed on their upward movement and opened on the downward movement, the pipes being held within a fire brick lining, and connected with means of heating and cooling.

SEPARATING PRECIOUS METALS FROM SAND, GRAVEL, ETC.—Pascal P. Cuplin, West Bend, Iowa. This invention relates to dry placer mining, and the separation is provided for without the use of water by means of an apparatus combining a revolving inclined screen with different degrees of fineness of mesh in connection with tubes leading from an air supply, chutes leading from the screens discharging into the tubes, and hinged gates in the chutes. The air pressure is supplied by bellows and a blower, and varies in the different tubes according to the grading of the material by the several sieves, each pan of the separated metals differing from the finest flour gold to grain gold.

Mechanical.

PORTABLE HYDRAULIC PUNCH.—Elijah B. Cornell, Philadelphia, Pa. This punch may be quickly placed in position for effective operation and as readily released from the work, being especially designed to facilitate the punching of the webs of railway rails, metal beams and plates, and structural, architectural or bridge work of all kinds. In connection with the punch piston is a coil spring, whose tension may be regulated, and which facilitates the backward movement of the piston after the punching has been effected, the liquid employed then escaping into the reservoir.

NUT LOCK.—Conrad Hahn, Pittsburg, Pa. This improvement comprises a plate adapted to be supported from the bolts, and having offsets which hold a bar over which is fitted a locking plate held in place by keys which engage the offsets. The device is simple and easily applied, and will positively lock the nut or nuts in place on rail joints, or in other places where it may be applied.

TAP AND REAMER WRENCH.—Elmer J. Nichols, Pawtucket, R. I. This tool comprises a stock with threaded neck on which screws a sleeve, the sleeve being mounted to turn on a handle connected with a movable jaw sliding in the stock. The handle connected with the movable jaw does not turn, but is moved bodily in or out to open or close the jaws.

Agricultural.

HARROW.—Joseph B. Morrison, Fort Madison, Iowa. The tooth holder of this harrow has upper and lower laterally projecting clamps which fit around the tooth, the inner ends of the side arms of the clamps being extended or prolonged over the body, forming flange-like portions separated from the body to form a seat for the rail plates, and separated from each other to avoid any obstruction to clamping the tooth against the rail. This improved tooth holder not only clamps the tooth firmly, but also braces and gives rigidity to the beam.

PLANTER ATTACHMENT.—William L. Stickles, Churchtown, N. Y. This is an attachment for a marker runner or shoe of a planter to form a clean cut bed and without clods to interfere with the growing plants, the ground at each side of the furrow being left very light. The improvement also provides a furrow attachment for the runners, especially those adapted for marking a field to be planted by hand, and one which may be readily adjusted to run as deeply in the ground as desired.

INCUBATOR.—Archibald Kerr, Carmichael's, Pa. According to this improvement the eggs contained in the incubator may be bodily turned over, being manipulated from the outside of the machine. The eggs are contained in revoluble trays perforated at top and bottom, enabling the hot air to circulate freely through them, the trays having doors or removable sections in one of their sides, permitting the trays to be lifted out singly without removing the tray drawer.

FOLDING COOP, ETC.—Thomas A. Allen, Astor, West Va. This is a coop or crate in which the sides and ends are jointed to the bottom, the sides folding inward and outward between the ends, and links connecting the ends and top and forming stops to limit the outward movement of the sides. It may be easily opened for use or folded into small space, being especially designed to facilitate the shipping of chickens, turkeys, pigs, rabbits, etc.

Miscellaneous.

BICYCLE SUPPORT.—Harry A. Brooks, Rapid City, So. Dakota. A leg member held to swing parallel with the machine is, according to this invention, pivoted and held by means of a lock lug from a pendent pivotal plate, in such manner that it will be held to a supporting position by the weight of the tilted machine standing alone, and will automatically swing up out of the way when such weight is removed. The device can be quickly secured to and removed from the frame of an ordinary bicycle, and when attached does not appear clumsy or otherwise mar the general effect of the machine.

BICYCLE SUPPORT.—Abraham H. Rihbany, Wauseon, Ohio. In guides at the front of the machine, according to this invention, is supported a rod at whose lower end is a fork straddling the front wheel, and links pivotally connect the lower ends of the fork with legs pivoted adjacent to the axle, whereby the legs may be thrown down into contact with the ground to support the wheel in upright position. This device is readily applicable to a new or an old machine, but in applying the improvement when a machine is built, the swinging legs may be pivoted to lugs extended from prongs of the steering fork.

SCALE BEAM COMPUTING ATTACHMENT.—Edward W. Wise, Las Vegas, New Mexico. According to this invention the weight held to slide upon the scale beam actuates a screw shaft and the gear connection of a computing cylinder, whose surface is arranged in columns bearing computed rates, in such way as to indicate both the weight and the price of the article being weighed, the movement of sliding the weight upon the beam causing the computation to be automatically performed, and the beam being capable of use in the ordinary manner at any time.

FINISHING COVERINGS OF BRAIDED MOULDS.—Franz Markgraf, New York City. The bulbous effects in gimp, trimmings, tassels, etc., heretofore principally finished by hand, are provided for by this inventor by a new method of and device for finishing the braided ends of covered moulds by a special machine, the braided projecting ends of mould coverings being inserted by a special progressive movement, whereby the work is performed in a superior manner and at greater speed.

SPECTACLE CASE HOLDER.—Robert T. Roberts, La Harpe, Ill. This is a simple device or clasp for fastening a spectacle case to the pocket of a garment. It consists of two lengths of wire, to be passed singly around and looped permanently upon the case, the wire being twisted together at the meeting point, and two hooks forming the terminals of a small length of twisted wire.

INK WELL.—John Werner, Brooklyn, N. Y. A tube is held in this well and a bucket slides in the tube, a stopper closing the tube and the neck of the well. A bail pivotally connected with the bucket is secured on the stopper, the bail having lugs fitting in slots in the tube to guide the bucket in its up and down movement. The construction prevents the writer from dipping the pen too far into the ink, which does not evaporate and become thick, and prevents the spilling of the ink if the well is upset.

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FENCE.—Lorenzo M. Shirtcliff, Lynnville, Ill. This inventor has devised an improved wire fence with metal channel bar posts, each having a foot flange seated on and attached to an angle-bent anchor plate, another angle anchor plate being attached to the side flange. Diagonal brace bars are also used at the corners, and there is a flexible guy connection between the brace bar and anchor blocks buried at different angles. The improvement also comprises novel wire-stretching devices for the end or corner posts.

WINDOW GUARD.—Charles E. Sowaal, New York City. To prevent people from falling through open windows, this inventor has devised a cheap and strong guard, which is readily applied or removed, and which permits of raising or lowering the window with the guard in place. It consists of a frame of pivoted uprights and cross slats, with diagonal braces having a sliding connection at one end, the frame being normally not wide enough to reach across the window frame, but by moving the top and bottom of the frame slightly toward each other, the frame locks itself into the window frame so as to be securely held.

WHIFFLETREE.—Lorenzo D. Brown, Shawnee, Ohio. This whiffletree has a bearing ring on its underside, the base plate having a groove to receive the ring, and an upturned hook on the base plate engaging one side of the ring, while a slide bolt engages the opposite side. It may be attached to the cross bar of a vehicle without boring a hole through and thus weakening it, and it is held in place in such a way that it cannot accidentally get loose. It is mounted to turn very easily, and may be readily released from the vehicle so as to tilt and unhitch the traces, thus permitting the horse to go free.

HEATER.—Herman Gutschmidt, Jersey City, N. J. For conveniently and rapidly heating a room by the employment of a lamp this inventor has devised a simple form of heater in which water is made hot and caused to circulate rapidly in a corrugated shell presenting large exposed surfaces to the air. The heater has a series of connected and vertically disposed water circulating compartments, the corrugations taking the place of water-circulating tubes.

BLACKING CASING.—Louis Nearing, Morris Run, Pa. This is a simple form of casing adapted to contain blacking, a dauber, and a brush, the back of the brush forming the lid of the casing, and the dauber and a blacking bottle being received in side pockets. The article may be cheaply made and takes up very little room, so that it may be conveniently carried in a valise or trunk.

DETACHABLE COFFIN HANDLE.—Jacob Klar, Rodney, Miss. Each handle bar is, according to this invention, connected by a flexible depending loop with a flexible carrier strand adapted to be passed under the coffin, there being a transverse bearing block held in a bight in the strand, to be brought into position at the lower corners of the casket. The improvement is designed to obviate the necessity for permanently affixed handles.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

PROCEEDINGS OF THE INTERNATIONAL ELECTRICAL CONGRESS HELD IN THE CITY OF CHICAGO. August 21 to 25, 1893. New York: American Institute of Engineers. 1894. Pp. xxiv, 488. Price $3.

It seems hardly necessary for us to do more than give the title of this work. The proceedings of the institute have acquired so high standing that any of their publications may be pronounced a sine qua non in every scientific library. As a matter of course, the present work represents the highest grade of publication in its own line. We may note that this volume is largely given up to alternating current work, and thereby the tendency of the day is indicated. The papers are not the only contents of the book, the discussions thereon forming most important reading. The paper on the Tesla oscillators is too brief, but is most welcome as a convenient memorandum of the great investigator's most recent work.

INEBRIETY OR NARCOMANIA: ITS ETIOLOGY, PATHOLOGY, TREATMENT, AND JURISPRUDENCE. By Norman Kerr. Third edition. New York: J. Selwin Tait & Sons. Pp. xxxv, 605. Price $3.50.

This exhaustive monograph represents an enormous amount of labor. It reviews the particular subject from the medical standpoint in the first part of the work, and afterward in the medico-legal aspects, the latter, of course, referring to the English court procedure. It contains a vast amount of very curious information, personal traits of inebriates, instances of false arrests and of decisions by magistrates in these cases. A most excellent index is appended, which consists of over twenty pages of fine type, worthy to be instanced as an example to authors and publishers of how a scientific book should be made. We do not hesitate to recommend it to our readers.

A TREATISE ON INDUSTRIAL PHOTOMETRY, WITH SPECIAL APPLICATION TO ELECTRIC LIGHTING. By A. Palaz. Authorized translation from the French. By George W. Patterson and Merib Rowley Patterson. New York: D. Van Nostrand Company. London: Sampson Low, Marston & Company. Limited. 1894. Pp. vii, 322. Price $4.

The astonishing development of photometry has been brought about largely by the electric light. This book is very complete, being written in the well known French style of exactness; yet, although France is not an island, we do find a certain amount of insularity in its treatment of the subject, some apparatus very extensively used in England and America being entirely omitted. The indexes seem hardly adequate to the amount of text. It is possible that upon looking through the book we might find much which the index does not show. We do not find the jet photometer for instance, and the registering jet photometer operated by the photographic process is not given either. The word burner and the proper name "Sugg" do not appear in the index at all. It would be impossible to imagine an American author writing on photometry without mentioning Sugg's London Argand gas burner as a standard burner for valuing gas. It is, however, but fair to say that the work is written with especial application to electric lighting, which would, of course, excuse, to a certain extent, the omission of gas photometry, something whose inclusion in the work would certainly have added much to its value.

THE FOREST TREE PLANTER'S MANUAL. 1894. By J. O. Barrett. Minneapolis, Minn.: The Progressive Age Publishing Company. Pp. 128.

We take especial pleasure in noticing this little pamphlet, which is sent free to all applicants who will remit 4 cents for postage. It gives a popular description of a number of trees and their availability, tells how to manage forest seedlings and cuttings, teaches applied entomology, zoology, and the economic and climatic conditions of the science of forestry and the local aspects thereof.

BREAD FROM STONES. A new and rational system of land fertilization and physical regeneration. Translated from the German. Philadelphia, Pa.: A. J. Tafel. 1894. Pp. 135. No index. Price 25 cents.

This work, translated from the German of Julius Hensel and others, touches on the subject of fertilization and advocates the use of clean fertilization. In the primeval rocks, it claims, can be found adequate fertilizers; these rocks being reduced to dust to become assimilable by plants or decomposable by the soil influences are the fertilizer it recommends. The subject is a curious one, and whether its premises are all correct or not, there is no question that the fine pulverization of barren material often makes it assimilable by plants under the influence of earth acids.

SCIENTIFIC AMERICAN BUILDING EDITION.

JANUARY, 1895.—(No. 111.)

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1. An elegant plate in colors, showing a Colonial cottage at Williamsbridge, N. Y., recently erected for Chas. H. Love, Esq. Two perspective elevations and floor plans. Cost complete $4,250. Mr. Arthur C. Longyear, architect, New York City. A pleasing design.
2. A Colonial residence at New Rochelle, N. Y., recently erected for J. O. Noakes, Esq., at Iselin's Park. Two perspective elevations and floor plans. Cost $5,000 complete. Mr. Manly N. Cutter, architect, New York City. An attractive design.
3. Colonial residence at Montclair, N. J., recently erected for Sylvester Post, Esq. Two perspective elevations and floor plans. Messrs. W. S. Knowles & A. H. Thorp, architects, New York City. A pleasing design.
4. A seaside cottage recently erected for C. H. Manning, Esq., at Kennebunkport, Me. Two perspective elevations and floor plans. A picturesque and unique design after the "New England" lean-to roof order. Mr. H. P. Clark, architect, Boston, Mass.
5. A residence at East Orange, N. J., erected at a cost of $7,000. Architect Mr. W. F. Bower, Newark, N. J. Perspective elevation and floor plans.
6. The First Presbyterian Church at Stamford, Conn. Two perspective elevations and ground plan. A design of great architectural beauty, treated in the Romanesque style. Mr. J. C. Cady, architect, New York.
7. A residence at Scranton, Pa., erected for E. B. Sturges, Esq., at a cost of $5,000 complete. Architect Mr. E. G. W. Dietrich, New York City. Perspective elevation and floor plans.
8. A summer residence at Cushing's Island, Me., recently erected at a cost of $3,100 complete. Two perspective elevations and floor plans, also an interior view. Mr. John C. Stevens, architect, Portland, Me. An excellent example for a summer home.
9. View of the Armory of the Seventy-first Regiment, New York City. Architect Mr. J. R. Thomas, New York City.
10. Perspective view and floor plans of the fourteen story Reliance Building, Chicago.
11. Miscellaneous contents.—Buff brick popular.—Ceiling and cornice tinting.—Home ground arrangement of plants, illustrated.—Stone dressing by compressed air, illustrated.—Brick dust mortar.—Interesting ruin of cliff dwellers.—Removing the front wall of a warehouse, with sketches.—Improved woodworking machine, illustrated.—Buff brick in New York.—Ceiling paper.—"Dec-co-re-o," a new material for decorative purposes, illustrated.—Improved gutter hangers, illustrated.—Draughtsman's supplies, illustrated.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
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Minerals sent for examination should be distinctly marked or labeled.

(6357) Old Mechanic writes for information with regard to the process of tempering edge tools called the lead process. Is the steel injured in the process of heating in lead, and what of the uniformity and toughness of such temper? A. The lead heating process for hardening edge tools is almost in universal use in all large establishments, and was only so largely adopted for its uniform control of the proper heat for hardening. By this process the burning of corners and thin edges is prevented by maintaining the temperature of the lead pot at the exact heat for hardening any particular brand of steel. There is nothing in the contact of the hot lead that will injure the steel, but rather, on the contrary, preserve it from burning or overheating, which is a great drawback in the uncertainty of fire heating.

(6358) L. D. W. writes: To answer a question, please state through your paper whether or not more steam is required to run a given amount of machinery when the exhaust from the engine is used for heating purposes than is required when the exhaust is allowed to escape in the open air? If so, please state what per cent more. A. To use the exhaust steam for any purpose is economy of the first order. Even if a small additional back pressure is made upon the engine. No high pressure engine exhausting through a pipe to and above the roof is free from back pressure. When a delicate pressure gauge is attached to the exhaust pipe close to the engine, the back pressure in most engines will be found to be from ½ to 1½ pounds. From the lowest pressure of ¼ to ½ pound, it is a saving to take the exhaust steam in a direct line from the exhaust port of the steam chest to be used for heating purposes, and, with proper precaution in the use of large pipe and its best distribution for facilitating the circulation with the least obstruction, it should not increase the back pressure. There are many examples in and around New York where a ¾ inch back pressure has been reduced to ¼ inch by the proper lay-out of an exhaust heating system.

(6359) D. S. says: I have made violin as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 930. I have done a good job and wish to have it finished in the best manner. Please let me know what to stain it with, also the kind of varnish to use. A. Dissolve

Sandarac	12 parts.
Shellac	6 "
Mastic	6 "
Elemi	3 "

In 150 parts 95 per cent alcohol which has been colored red with cochineal, or if a darker red is required, add dragon's blood gum. When the above is dissolved add 6 parts Venice turpentine. As this varnish is highly inflammable, use caution as to fire. Find the tone of a piece of wood by direct comparison with similar notes on the piano or any standard instrument. A violin in tone at the proper pitch by a tuning fork is very convenient. Tone of Wood for Same.—Dissolve by heat 2 ounces amber in oil of turpentine, 5 ounces, and drying linseed oil, 5 ounces. Color with dragon's blood or extract alkanet root. The tone given by a piece of wood depends upon its size, thickness, etc. Therefore, a test must be comparative. Cut square plates of equal size and thickness of a known wood and of the wood to be tried. Place the center of the plate upon end of a cork or spool placed upon a table near the edge. Press the center of the plate of wood with the thumb and bow it near one of the corners. This will give the lowest note such a plate can produce, or the normal tone. The higher the tone, the better the wood. From the "Scientific American Cyclopedia of Receipts, Notes and Queries."

(6360) H. L. S. says: Will you advise me as to the best preparation for filling worm holes in wood? A. Put any quantity of fine sawdust of the same kind of wood into an earthen pan, and pour boiling water on it; stir it well, and let it remain for a week or ten days, occasionally stirring it; then boil it for some time, and it will be of the consistence of pulp or paste; put it into a coarse cloth and squeeze all the moisture from it. Keep for use, and, when wanted, mix a sufficient quantity of thin glue to make it into a paste; rub it well into the cracks, or fill up the holes in your work with it. When quite hard and dry, clean the work off, and if carefully done, you will scarcely discern the imperfection.

(6361) A. J. B. says: Will you please inform me, through the columns of your valuable paper, to what species does the whale belong; is it a fish or an animal? A. A whale is an animal inhabiting the ocean; it belongs to the class of mammals, tribe of mutilates and family of the cetacea.

(6362) C. E. McM. writes: 1. I saw some time ago that a storage battery would give approximately one ampere for each square foot of positive plate; does that mean the entire suface of positive plate? A. A discharge rate of 6 amperes per square foot of positive plate may be allowed. This is per square foot of plate immersed, not of area. It is one-half the area. 2. I have two storage batteries, 8 plates each, plates 6×7, and are pasted with red lead. What would be about the electromotive force and internal resistance of each? Can I run a one candle power incandescent lamp with them both? A. For each couple allow two volts, and calculate discharge rate as above. The resistance may be very much less than the above would give—perhaps 0·01 ohm. Your batteries should be ample for the lamp named.

(6363) H. C. L. asks (1) how to make the best kind of batteries to run sewing machines by? A. Practically speaking, you can only use a storage battery. The primary battery is expensive and troublesome. See our SUPPLEMENT, No. 845, for storage batteries. 2. How much will it cost per day? A. We cannot give accurate figures—probably two or three dollars. 3. What are the rules for calculating the resistance to give electro-magnets at various distances from the battery, as in telegraphy? A. In general the resistance of the line and battery are made equal. There is no exact rule for what you ask. 4. How many watts are necessary to run a sewing machine? A. Twenty to fifty, according to size and work done.

(6364) C. G. C. writes: I have an electro-magnet (horse-shoe form), 1⅞ inch between poles; spools are ⅞ inch diameter. What size horse-shoe magnet would I have to use with it to make a satisfactory magneto-electric machine for medical use? A. Use a 6 or 8 inch machine magnet. 2. In building tall chimneys for factory use (say 100 feet) is it usual to lessen the size of flue toward the top? A. No. 3. What is Lapis Calaminaris, and what is its use? A. Zinc silicate or calamine, an ore of zinc. 4. From whom can I buy the weights and measures of the metric system? Is it probable that the system will before long come into general use in this country? A. Address Queen & Co., Philadelphia, Pa. It seems doubtful if they will come into general use for many years.

(6365) F. B. C. asks: How many cubic feet of illuminating gas (from gasoline) can be compressed into a vessel containing 10 liquid gallons, at 5 pounds and 10 pounds pressure per cubic inch? A. If a permanent gas is made, then at 5 pounds pressure the vessel will hold about 13 gallons, and at 10 pounds about 17 gallons. If the gas is partly condensed to a liquid under the given pressure, much more will be held.

(6366) M. F. P. asks how gas can be prevented from smoking. A. If the gas is very rich, it should be burned in small size excavated head burners. Proper burners prevent gas from smoking. The richer the gas, the harder it is to overcome this trouble.

(6367) H. I. P. asks for more information about Mr. Vaughan-Sherrin's new electric boat, described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 786, January 24, 1891. A. We have nothing additional to the article referred to.

(6368) T. P. M. says: Will you please give me a good receipt for an oil wood filler, and one that is not an oil filler, for hard woods where a very fine surface is required? Also a filler for cast iron, such as the fields of dynamos and castings of engines, etc. A. Hard Wood Filler.—Use boiled oil and enough corn starch to make a very thick paste. Add a little japan, and reduce with turpentine. Add no color for white oak; for dark ash and chestnut use a little raw sienna; for walnut, burnt umber and a very little Venetian red; for bay wood, burnt sienna. Use enough color to cover the white of the starch. Apply with brush and rags. Let it dry forty-eight hours, or until it is in condition to rub down with No. 0 sandpaper, without much gumming up, and if an extra fine finish is desired, fill again with the same materials, using less oil, but more of japan and turpentine. The second coat will not shrink, it being supported by the first coat. When the second coat is hard, the wood is ready for finishing in any desired style or to any degree of nicety by following up the usual methods. This formula is not intended for rosewood, and will not be satisfactory if used therefor. American Wood Filler.—Apply to the wood with a brush the following mixture: Pulverized starch by weight, 3 parts; heavy spar, 3 parts; ½ part by weight of siccative, with enough turpentine to make the consistency of ordinary varnish. For dark woods add to the siccative umber up to ½ part. Rub across the grain of the wood with a piece of felt fastened to a piece of wood. Let the wood dry about eight hours, rub with glass paper, then polish and varnish. Composition to Fill Holes in Castings.—1. Dry clay, 6 parts; borax in solution, 1½ parts. Mix. 2. Make a thick paste of pulverized binoxide of manganese and a strong solution of silicate of soda.

(6369) R. W. S. asks: 1. With a potential of 25 volts and a current of 8 amperes, how many 6

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candle power incandescent lamps will be lighted, each lamp requiring a voltage of 9 to 12 and amperage 1 to 1½? A. Ten or eleven. 2. How many 3 candle power lamps, each lamp requiring a voltage of 6 to 7 and amperage 1 to 1½? A. Twenty. 3. What size of pure lead wire will 8 amperes fuse? A. A wire 0·04 inch in diameter (approximately).

(6370) F. C. S. writes: How can I melt about two pounds of glass? Can it be done in an ordinary stove in a crucible or not, and will a plaster of Paris mould answer to pour it into? A. Glass cannot be manipulated as you specify. A high and prolonged heat is required, and it must be shaped in moulds by blowing or pressing. Plaster of Paris moulds will not answer. Simple pouring into a mould will not answer.

(6371) J. E. G. asks: 1. In making a machine as described by Mr. Bonetti in the SCIENTIFIC AMERICAN of May 26, 1894, is it necessary to shellac the glass disks, if glass is used? A. Shellac the glass disks. 2. What is mosaic gold that is used to excite the machine and how is it made? A. Bisulphide of tin; it is made by igniting at a low red heat 12 parts tin, 6 mercury, 6 salammoniac, 7 flowers of sulphur. The "mosaic gold" remains in the bottom of the crucible. 3. Are the collectors a set of combs like those on an ordinary Wimshurst machine? A. Yes. 4. Are there any acids that I could depend upon to go through glass to make an inch and a quarter hole, and how must I do it? A. Use a copper or brass tube, with emery powder and turpentine. Cement a cork to the glass for a guide and fix the tube in a carpenter's brace and grind through it. No acid can be used. 5. Is plaster of Paris a non-conductor when thoroughly dry and made into moulds? A. It is a very poor one.

(6372) V. M. writes: What is the reason that arc incandescent electric lamps are not in use much or not at all? A. As a matter of practical lighting, the electric profession has settled upon using the full arc or ful incandescent lamp. The intermediate types do not present the advantages of either extreme type.

(6373) C. H. M. asks whether a Leyden jar or an electric condenser can be charged with an ordinary battery. A. The jar or condenser can be charged, but unless the battery were of very high voltage the charge would be weak.

(6374) C. H. P. writes: I would like to know the output in volts and amperes of a 50 light 50 volt transformer used as a common induction coil, the coarse coil connected to a 50 volt circuit with ten 16 candle power 50 volt lamps in series. Primary has 2 layers No. 4 wire. Secondary 12½ pounds of No. 14. A. You do not give relative number of turns of wire. It will approximately reproduce the voltage of the primary lighting circuit for which it was constructed, provided it is excited by the secondary alternating current of such a circuit. For amperage divide the voltage by the resistance (about 2½ ohms) of the zinc coil.

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January 15, 1895,

AND EACH BEARING THAT DATE.

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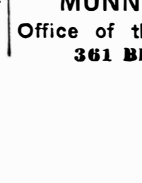

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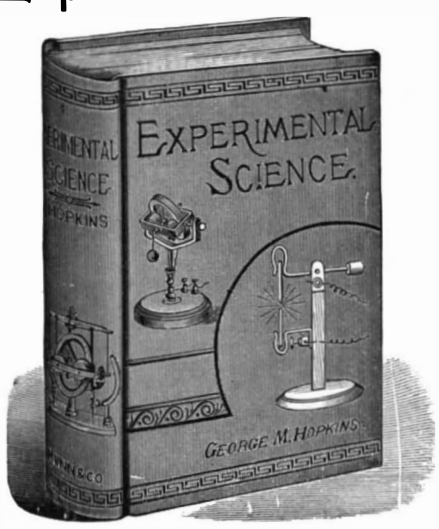

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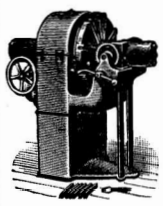

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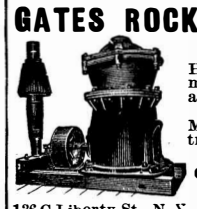

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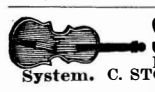

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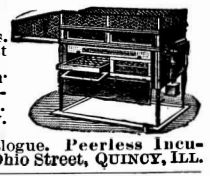

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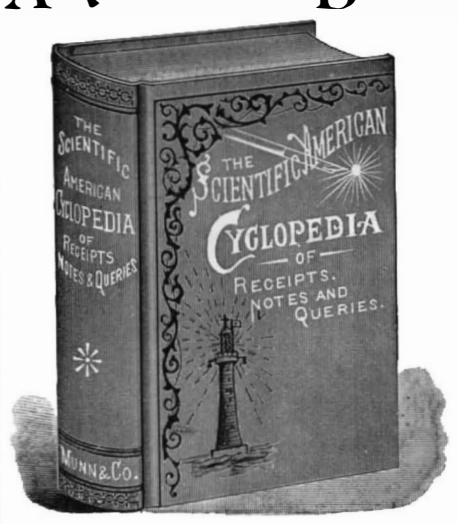

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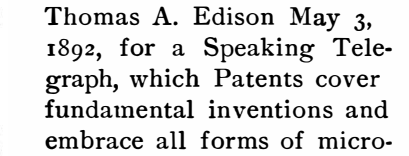

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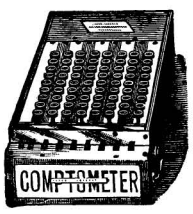

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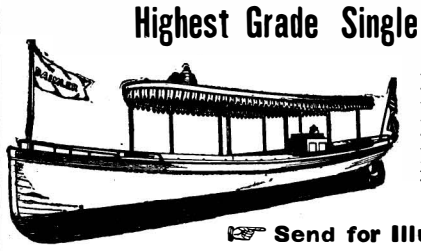

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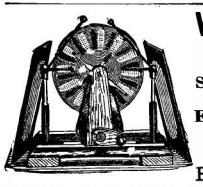

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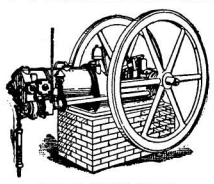

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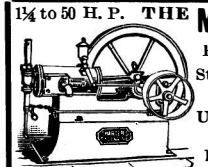

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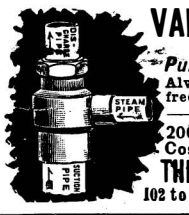

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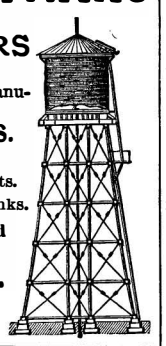

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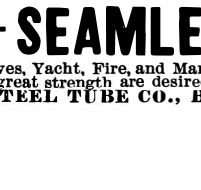

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